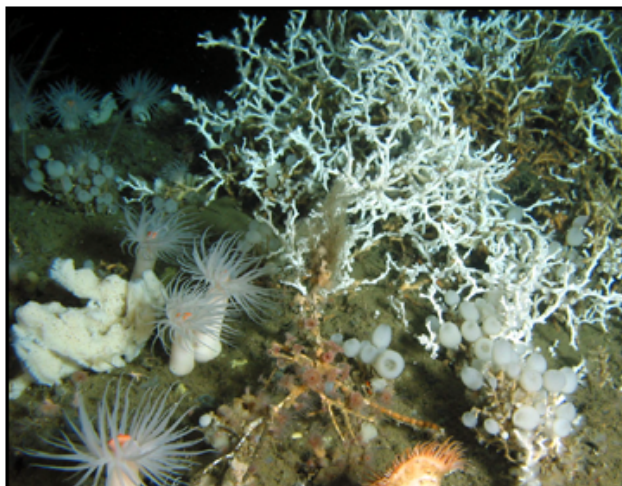


Synoptic Cruise Report

30 September, 2004

***Lophelia* Reef Fish & Mobile Megafauna Community Structure, Biotope Affinities, and Trophodynamics**



Cruise USGS-GM-2004-03, Gulf of Mexico, 29 July – 5 August, 2004

USGS OUTER CONTINENTAL SHELF ECOSYSTEMS STUDY PROGRAM

R. Allen Brooks, Andrew J. Quaid, Kenneth J. Sulak, Steve W. Ross

**Coastal Ecology & Conservation Research Group
Florida Integrated Science Center, CARS, Gainesville, FL**

***Lophelia* Reef Fish & Mobile Megafauna Community Structure, Biotope Affinities, and Trophodynamics**

**Synoptic Cruise Report
Cruise USGS-GM-2004-03**

R. Allen Brooks, Ph.D., Research Benthic Ecologist^{1*}
allen_brooks@usgs.gov
(352) 264-3478

Andrew J. Quaid, Chemical Oceanographer^{1*}
andrew_quaid@usgs.gov
(352) 264-3523

Kenneth J. Sulak, Ph.D., Research Fish Biologist¹
Project Supervisor
ken_sulak@usgs.gov
(352) 264- 3500

Steve W. Ross, Research Associate Professor^{1,2}
University of North Carolina – Wilmington
USGS IPA
rosss@uncw.edu
910-395-3905

¹ Coastal Ecology & Conservation Research Group, USGS – Florida Integrated Science Center, CARS, Gainesville, FL 32653

² Center for Marine Science, University of North Carolina- Wilmington, 5600 Marvin Moss Lane, Wilmington, NC 28409

This USGS Project Report is an unpublished technical report. It is not copyrighted and may be cited and copied freely. It is available on CD-ROM upon request from the USGS Lead Scientist, and is also available in .ftp format online at: <http://cars.er.usgs.gov/coastaleco/>. This synoptic report is intended as a first quick-look report of cruise USGS-GM-2004-03. Definitive species identifications and data quality are subject to refinement and correction in the process of definitive compilation, verification, and analysis.

Cover page illustration:

Left - Digital image of a NE Gulf of Mexico *Lophelia* community at 350 m depth obtained with the Johnson-Sea-Link's underwater digital camera (K. Sulak). Right – Digital image of launching the Johnson-Sea-Link submersible (A. Howard).

*Contact Persons for Data Requests

TABLE OF CONTENTS

Introduction	1
Objectives	2
Methods	3
Preliminary Results	9
Metadata & Status	16
References	20
Appendix I	Tables
Appendix II	CTD Archive

INTRODUCTION

There is a rapidly growing social, political, and scientific awareness of the destruction of sensitive deep coral reefs, and the potential loss of unexplored biodiversity, by human activities including bottom trawling, anchoring, pollution, and offshore oil and gas development. In the Gulf of Mexico, MMS exercises an ecological stewardship role for sensitive hard-bottom and reef habitats relative to hydrocarbon exploration and development activities. The present USGS community structure investigation, together with companion investigations by USGS microbiology and genetics research teams, addresses gaps in knowledge of *Lophelia pertusa* deep reef ecosystems in the Gulf of Mexico, with particular emphasis on fish and mobile invertebrate megafauna, and sediment-dwelling macrofauna and meiofauna (Figure 1). The overall USGS 2004-2006 program of studies complements and coordinates with a concurrent contract study undertaken by Continental Shelf Associates (CSA, 2003) on behalf of the MMS.

Figure 1. A *Lophelia* bush and associated epifauna. Viosca Knoll 826 area, 500 m depth.



OBJECTIVES

The USGS project research team established a study plan with six main objectives (Sulak et al., 2004). The objectives are outlined below and combine a diverse set of capabilities and expertise.

- 1) CEC Objective - Define species composition, diversity, and numerical dominance of fishes and mobile megafaunal invertebrates on Gulf of Mexico (GOM) *Lophelia* reefs.
- 2) CEC Objective - Define and compare mobile megafaunal, and infaunal macrofaunal, and meiofaunal biotope affinities, population densities, biomass, diversity and population dispersion for the three *Lophelia* biotopes: prime high reef, secondary low colonies, dead rubble zone, and for comparative off-reef soft substrate biotope.
- 3) CEC Objective - Obtain tissue samples (target n = 30 samples per taxon or ontogenetic stage) for analysis of stable carbon, nitrogen, and sulfur isotopes. Samples to be obtained both from *Lophelia* community (all three biotopes) and general surface to substrate water column community, including plankton and *Sargassum* carbon sources.
- 4) CEC Objective - Obtain *Lophelia* and soft coral branch/stolon samples to determine ages via ring-count methodology.
- 5) CEC Objective - Contrast megafaunal fish, and mobile invertebrate community structure for Gulf of Mexico versus North Carolina *Lophelia* reefs.
- 6) CEC Objective - Using video and digital images, document any interaction of the *Lophelia* community fauna with disparate fish and mobile invertebrate megafaunas continuously or facultatively utilizing deep coral habitat.
- 7) Multi-PI Objective – Facilitate multidisciplinary investigation in a larger coordinated program of coral genetics (King, Schill, Morrison), coral microbiology (Kellogg), invertebrate taxonomy (Nizinski), comparative ecology (Ross), coral aging (Williams), and paleoecology (Risk).
- 8) Coordinate with the complimentary MMS contractor program of investigation at the same sites.

METHODS

Scientific Crew

A diverse scientific team participated in the cruise representing four USGS centers, five academic institutions (McMaster University, University of Florida, University of Montreal-Quebec, University of New Orleans, University of North Carolina-Wilmington), and NOAA's National Marine Fisheries Service (Appendix I, Table 1). Expertise ranged from GIS to paleoecology specialists providing for multiple new insights into the GOM *Lophelia* reef community.

General Operations Schedule

06:30- Began preparations for morning submersible dive
06:30-07:30 Set and drift determination by ship prior to submersible launch
07:30 – Pre-Dive meeting called by submersible operations chief
08:00-11:30 Morning submersible dive. Non-diving scientists were involved either in their own laboratory and data operations, downloading and transcription of digital dive tapes, work up of specimens and data from previous sampling, echo-sounder watch on the bridge, and attention to specimens and tapes immediately upon surfacing of submersible.
12:00-14:00 Between dive sampling (dipnet, plankton net, and angling for stable isotope samples)
14:30 – Set and drift determination by ship prior to submersible launch
15:30– Pre-Dive meeting called by submersible operations chief
16:00-19:30- Afternoon submersible dive
20:00 – Daily scientist meeting
20:30:00-06:30 – Remote sampling for isotope samples (otter trawl, benthic sled), echosounder transecting for bottom surveys

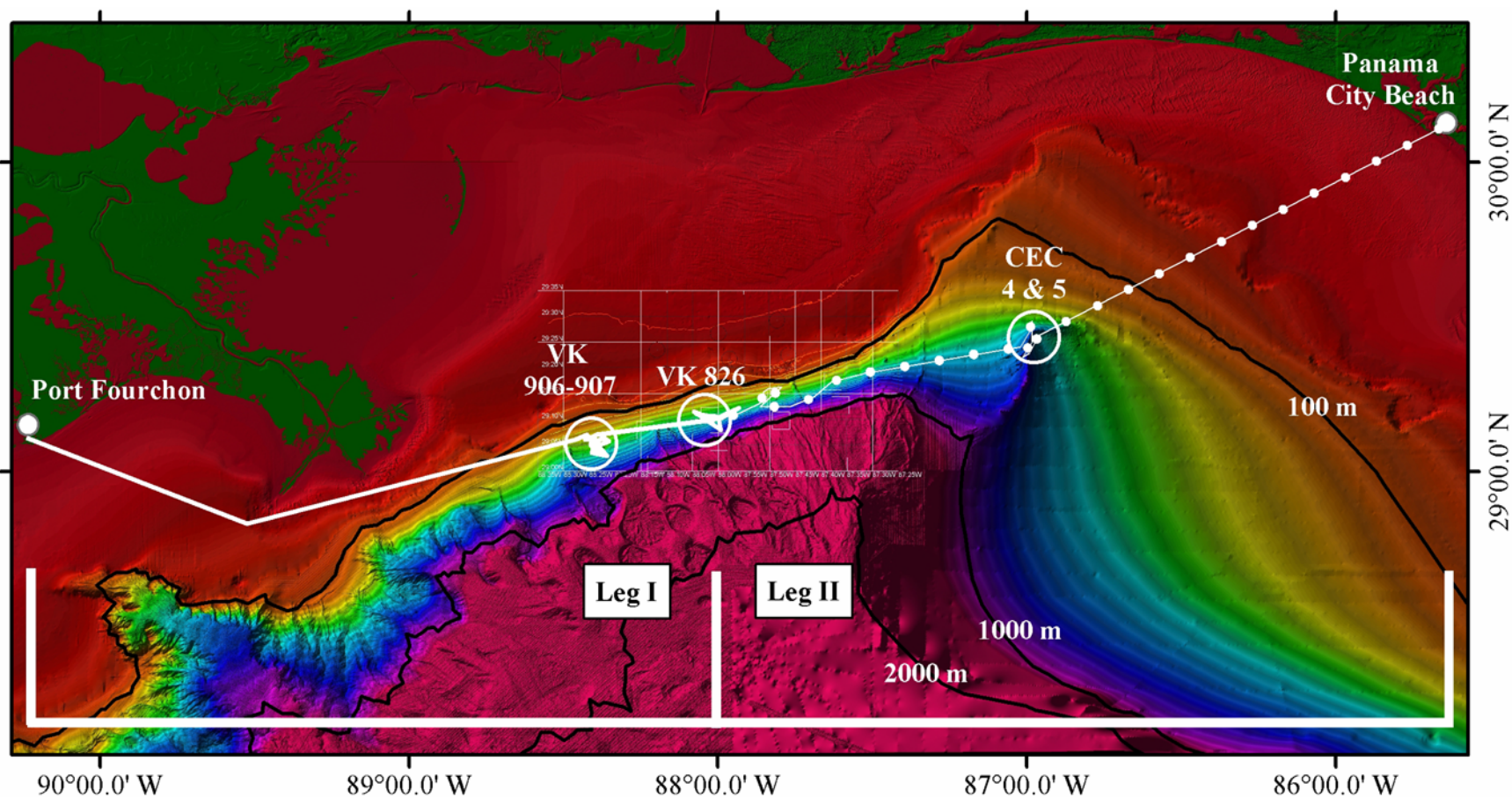
Study Area

The 2004 mission study area was located offshore of Alabama, to the west of the DeSoto Canyon (Figure 2). The cruise consisted of two legs, the first being the MMS Leg I (OCS Program Funds), during which Viosca Knoll 906-907 and Viosca Knoll 826 were explored. The second leg, USGS Leg II (FISC Funds), consisted of exploring the CEC 4 and CEC 5 sites, which were not previously surveyed. Prior to this mission, a one day echosounding survey was conducted at site CEC 4 and CEC 5, with results suggesting possible reef habitat. Actual submersible dive locations were selected based upon the results of echosounder transects.

GIS Database

The cruise track and individual submersible dive tracks were entered into ArcGIS 8. The location of the R/V Seward Johnson II was logged at all times using the geotracker extension for ArcGIS. The geotracker extension allows for real-time logging of a Garmin GPS. Logging was set at 60 second intervals during transit and 10 second intervals during operations. The submersible's trackpoint system logs its location on a 1 second interval by triangulating the two acoustic beacons mounted on the submarine. The trackpoint system has a wide range of error confounded by wave action and boundary layers influenced by differences in water mass sound attenuation. To filter out spurious location data the following protocol developed by CEC/USGS (Quaid) was performed. Knowing the submersible's top speed is 1 knot, and with the influences of current, it was assumed that the top speed would be roughly 1.5 knots. Thus, any recorded tracking points that indicated a speed of over 1.5 knots were excluded from the data set.

Figure 2. A map showing the study area, located in the northeastern region of the Gulf of Mexico. The cruise track is highlighted in gray. The cruise was composed of two legs, MMS leg I (VK 906-907 & Vk 826), and USGS CEC leg II (CEC 4 & 5).



Sampling Platform

The R/V “Seward Johnson II”, a UNOLS Harbor Branch Oceanographic Institution vessel, mother ship for the Johnson-Sea-Link I (JSLI) submersible, was used as the sampling platform for this cruise.

Echosounder Surveys

The R/V Seward Johnson II (SJII) is equipped with a SIMRAD EQ50 video echosounder with 38/50 kHz. The echosounder was used along the 500 m isobath and at specific target sights to profile the bottom. Of interest were “fuzzy” (diffuse acoustic strength) bottom returns which are normally indicative of coral (Figure 3). In contrast, bare consolidated sediments or hard-bottom results in a solid, high strength acoustic signal.

In-Situ Sampling Gear

Submersible

The JSLI submersible was used to collect specimens and video photography from each study location. The four person JSL submersible is capable of dives to 914 m. It has several types of active sampling gear including a manipulator arm and suction hose (Reed 2002). The submersible also had the capability of collecting several types of passive information while on the bottom including visible information recorded using a video camera. Environmental information (i.e., water parameters) was also collected in real-time using a CTD attached to the submersible which records temperature, conductivity, salinity, oxygen concentrations, pH, and depth. The geographic position of the submersible on the bottom was determined using the SJII JSL Trackpoint system and USGS Navtech navigational software.

Specialized Submersible Sampling Gear

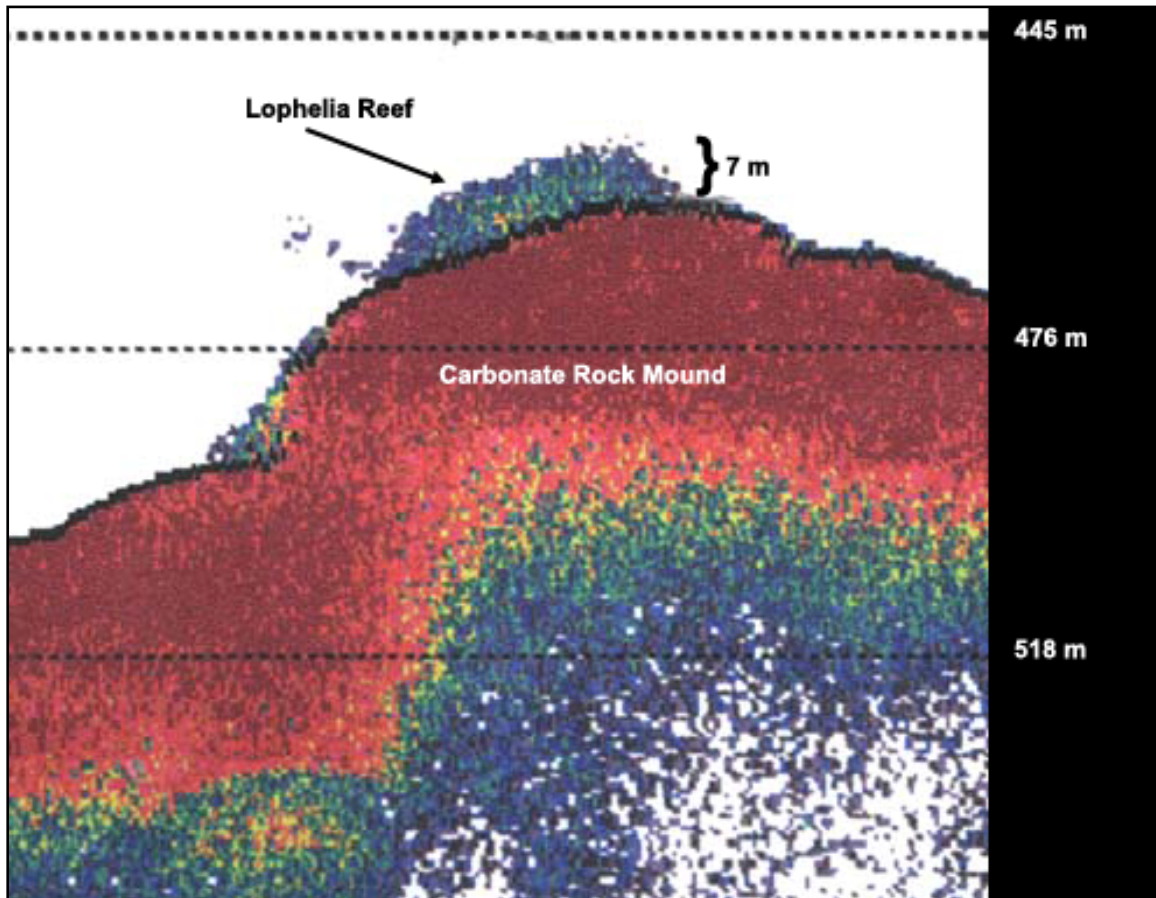
The USGS constructed an array of sampling devices to increase the collection capability of the submersible’s mechanical arm and suction device.

Microbial Isolation/Sterility Chambers – A specialized sampling device was designed by Kellogg to collect uncontaminated live and fixed *Lophelia* samples for microbial analysis. The sampler allowed for preservatives to be applied to live tissue at depth within sealed chambers.

Coral Fork – A specialized coral fork was designed to collect live and dead *Lophelia* samples for both coral genetics and paleo-aging work.

Yeargin Sampler – A sampling device was constructed to enable the collection of an entire *Lophelia* bush including all of the fauna living within the coral matrix. The sampling device was 1 m in diameter, barrel shaped, and made out of trap wire with mesh liner. The sampler had a spring loaded closing mechanism that could be triggered by the submersible’s mechanical arm.

Figure 3. An echosounder profile of the seafloor that shows “fuzzy” bottom returns that normally indicate coral or hard-bottom structures. This reef, named “Big Blue Reef”, rests on the east flank of VK 826. This echosounder transsect ran from east to west, and GPS coordinates for the top of “Big Blue Reef” are 29° 10.181’ N, 88° 00.520’ W.



Sediment Cores – Sediment coring tubes were designed that could be deployed using the submersible’s mechanical arm. The tubes (5 cm diam. x 30.5 cm length) were made out of Lexan and contained a spring reinforced valve made from a rubber stopper. Each coring tube was housed in a color coded PVC sheath. The different colors allowed for specific notation of where individual samples were taken from. Sediment samples were sieved on board the ship through first a 0.5 mm screen followed by a 0.063 mm screen. The invertebrates separated out in the 0.5 mm size fraction correspond to macroinfauna while those retained in the 0.063-0.49 mm size fraction correspond to meiofauna.

Small Buckets – Twenty-four small buckets were fashioned to be used on the submersible's lazy-susan collection-bucket system. The buckets were 0.15 m in diameter with a 0.5 mm mesh screen covering the top. These small buckets were designed to retain sediment-dwelling macrofauna collected during suction sampling.

Rotenone Pump – A five gallon plastic gas can was fitted with a 500 gallon per hour bilge pump for high volume dispensing of a rotenone suspension. Rotenone is a natural root extract which causes respiration arrest in fish allowing for their collection. Effectiveness of rotenone collection was facilitated by altering the suspension density with a sugar/salt/liquid soap solution.

Traps – Two different types of traps were deployed to collect small benthic fish and epifaunal invertebrates. One trap was rectangular shape (61 cm x 61 cm x 25 cm) while the other was designed as a triangular purse (30 cm x 61 cm x 27 cm H). Both traps were covered in Vexar (0.8 cm mesh) to prevent escape and were baited with frozen squid. Traps were deployed at the beginning of a dive and either collected at the end of that dive or during a latter dive, thus varying the soak time.

Video

The video camera on the JSLI is an 850 TVL high-resolution camera, which sends a serial digital (SDI) signal to the sphere (Figure 4). In the sphere this signal is recorded on a JVC Digital-S deck, and is then sent to a SDI-to-analog component converter, which has a composite video output. The composite video output has a virtual overlay applied showing the time, date, and physical parameters, which is then recorded by a mini-DV deck. Onboard the ship, the Digital-S tapes are duplicated using a BR-D40U recorder/player, which sends a professional analog Y/R-y/B-y 3 line signal to a mini-DV recorder.

Digital Still Camera

The JSLI is equipped with a fixed digital camera and strobe. The camera is a Canon Powershot G2 in a depth-rated waterproof housing. It stores 11 MB JPEG images on a compactflash card with a resolution of 28 pixels cm⁻¹.

Remote Fish/Invertebrate Collection

A variety of gear types were utilized for both fish and invertebrate sampling, and each gear type is detailed below. Specimens were identified to species when possible and length measurements (standard, fork, or total) were taken for all fish specimens collected. Stomachs were removed from non-photo fish specimens and preserved in 10% formalin. In the laboratory, the stomachs were excised for the removal of prey to be later organized into functional categories. A wet weight will be estimated for each functional category after blotting dry. For selected taxa, the size of prey items will be either measured directly for intact items or estimated for broken items. When possible an attempt

will be made to identify the dominant food items to species.

Figure 4. A still photograph of *Grammicolepis brachiusculus*, (Thorny Tinselfish), grabbed from the JSLI video of dive USGS-GM-2004-03-JSL4751 using Video Charge© software.



Angling – Higher-trophic-level “pelagic” species were collected while trolling using artificial bait. The tissue samples obtained are essential to stable isotope analysis of surface to substrate trophodynamics.

Trawl – A 4.9 m, small mesh otter trawl (3.8 cm throat and bag mesh, and 0.6 cm cod mesh) was deployed to sample near-reef and away-from reef benthic fauna. Trawl tows were made during nighttime hours.

Longline – A 15 m length of heavy fishing line, with six snoods attached, was deployed to the bottom to sample benthic fish. The line was baited with frozen squid.

Tangles – A multi-stranded rope bundle, which consisted of many pieces of line which were frayed on the ends, was towed along the bottom attached to the cod end of the trawl.

Sled – A 1 m wide by 30 cm high modified Woods Hole epibenthic sled (0.125 cm mesh) was deployed to collect small benthic fishes and epifaunal invertebrates. The sled was modified to protect its lining from being torn on submerged obstacles by adding a poly-vinyl chaffing guard.

Stable Isotope Collection

Fish tissue, invertebrate tissue, phytoplankton, zooplankton, and *Sargassum* samples were taken for stable isotope analysis (nitrogen, carbon, and sulfur). A target number, of 30 specimens per taxon, was established to insure statistical robustness. Approximately 5 g of tissue from each sample was preserved by freezing in 2 ml glass vials. Phytoplankton and zooplankton were sampled using a 0.5 m diameter double-ring net consisting of a 335 µm mesh net sewn inside of a 125 µm mesh net. *Sargassum* samples were collected using a dipnet.

Water Chemistry

A Seabird (Model SBE 19+) conductivity, temperature, and depth instrument (CTD) was used to record water parameters. The data contain the following parameters: temperature (0.0000 °C), oxygen concentration (0.000 ppm), density (0.000 kg/m³), salinity (0.000 PSU), pH (0.01), and elapsed time. Data manipulation was handled in a series of steps. The first three steps (conversion from hexadecimal to text format, derivation of density, salinity, and then depth-bin averaging of data) were processed using the SBE-data processing program, provided by Sea-Bird Electronics Incorporated. The fourth step was to import the text file (of all converted and derived data) into a Microsoft Excel spreadsheet.

PRELIMINARY RESULTS

Sampling Stations

The cruise track spanned 275 n. mi. (Figure 2). Thirty-three sampling stations were completed (Appendix I, Table 2). Viosca Knoll 906-907 was visited for two days (30-31st July, Figure 5), and Viosca Knoll 826 was visited for three days (1-3rd August, Figure 6). On the night of the 2nd and early morning of the 3rd, the boat steamed south of the Ludwig & Walton site to conduct two off-reef bottom trawls and one CTD cast. During the last day of sampling, August 4th 2004, CEC Sites 4 and 5 were visited (Figure 7).

Figure 5. Stations sampled at the Viosca Knoll 906-907 sampling site (MMS leg I).

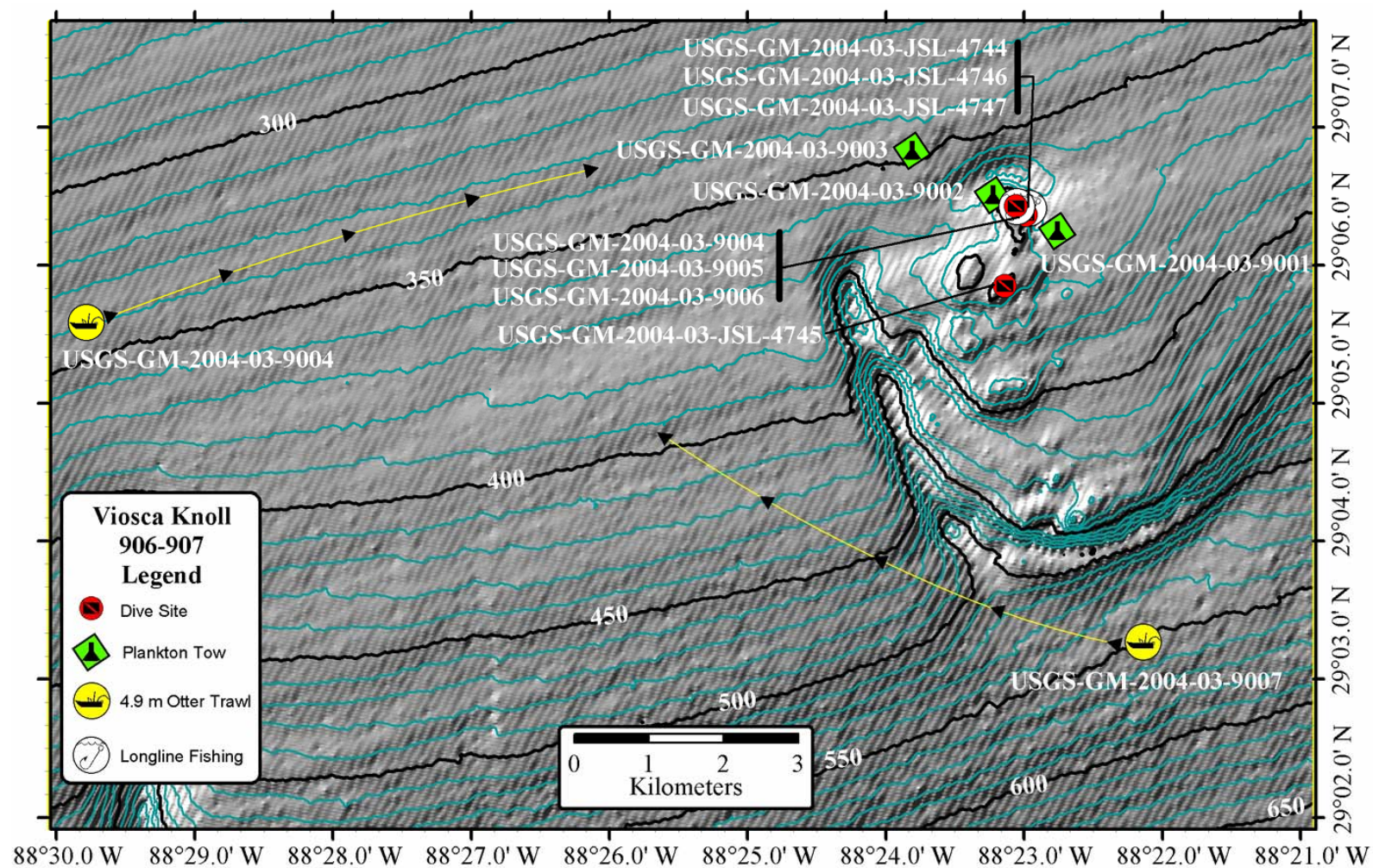
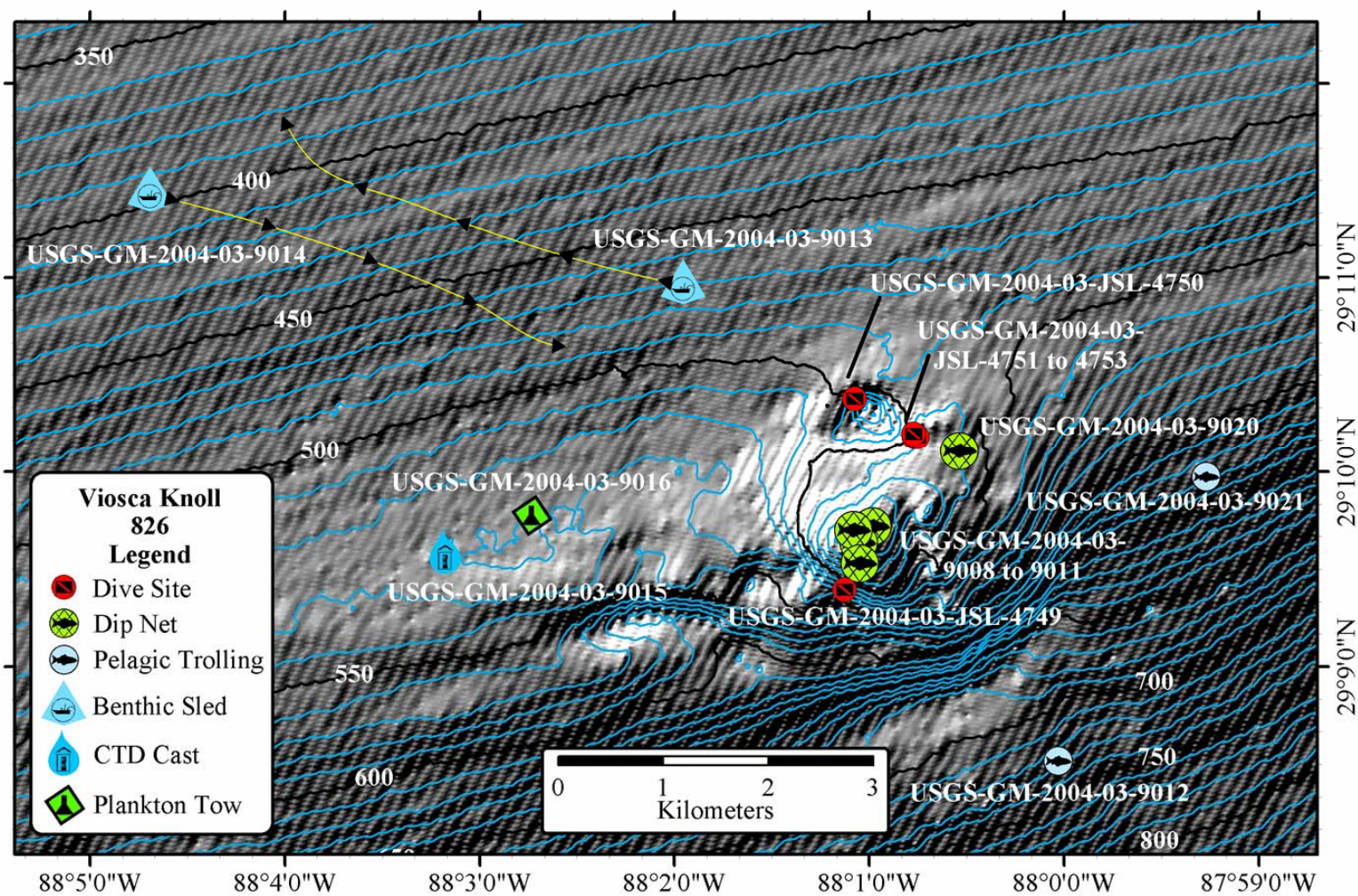


Figure 6. Stations sampled at the Viosca Knoll 826 sampling site (MMS leg I).



Echosounder Surveys

Echosounding transects revealed a dynamic topography on the seabed along the 500 m isobath. A previously unknown *Lophelia* site we named “Big Blue Reef” was located during one of our surveys (Figure 3). Submersible investigations of the area documented the greatest extent of *Lophelia* colonies from among all known GOM *Lophelia* sites (Figure 8).

Submersible

Twelve dives were completed using the JSLI corresponding to dives USGS-GM-2004-03-JSL-4744 through USGS-GM-2004-03-JSL-4755 (Appendix I, Table 3). Four dives were conducted in the area of Viosca Knoll 906-907 (Figure 5), six dives in the area of Viosca Knoll 826 (Figure 6), one dive in the area of CEC 4 (Figure 7), and one dive in the area of CEC 5 (Figure 5). Over these dives, 84 hours of video were taken which includes Digital-S, miniDV, and internal Handicam video (Appendix I, Table 4). Two hundred digital still pictures were taken during the twelve dives including numerous shots of the *Lophelia* community and adjacent non-structured habitat (Appendix I, Table 5). Audio recordings were made during each dive by scientists in both the bow and stern compartments. All of the audio recordings have been transcribed to paper logs. The audio log will be used to document the predominant habitat transversed during a dive.

Fish/Invertebrate Collection

Fish specimens were collected (n=332) using a variety of techniques including submersible suction sampling (with rotenone), four trawling stations, two longline stations, two benthic sled stations, two angling stations, and five dipnet stations. Fish collected represented 48 different species (Appendix I, Table 6). From these specimens 196 stomach samples (Appendix I, Table 7) were taken and 37 individuals were photographed (Appendix I, Table 8).

Invertebrates collected represented almost 70 different species from various phyla (Appendix I, Table 9), including octocorallians (i.e., soft corals), scleractinian corals, polychaetes (including chemosynthetic tube worms), arthropods (crabs, shrimps, pycnogonids), echinoderms (sea stars, brittle stars, urchins, crinoids), and molluscs (gastropods, squid, octopus). Thirty-five different invertebrate specimens were photographed (Appendix I, Table 8). Eleven sediment samples were collected both near and away from *Lophelia* bushes for the analysis of benthic infauna (Appendix I, Table 10). The suction sampler was used instead of the coring tubes, after the tubes were found to have insufficient suction in the coarse coral-sand sediment.

Microbial Samples

Ten discrete *Lophelia* colonies were sampled during dive USGS-GM-2004-03-JSL-4746 and again on dive USGS-GM-2004-03-JSL-4753. Processing involved plating agar for bacteria and frozen DNA extractions of the microbial communities. Initial results were the cultivation of 3 vibrio colonies on a TCBS

Figure 7. Stations sampled at the CEC 4, CEC 5, and to the south of Ludwick and Walton Pinnacles (USGS leg II).

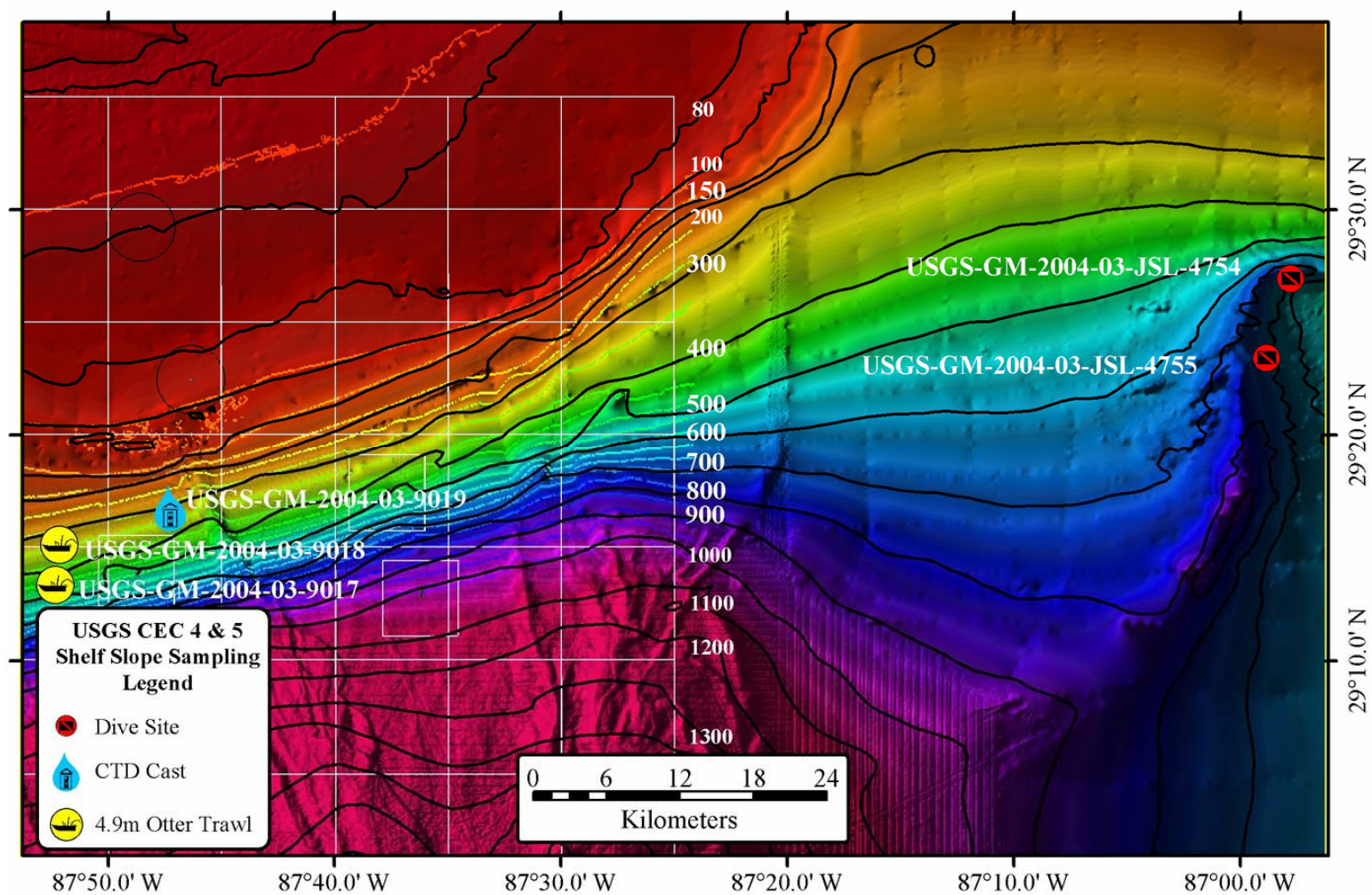
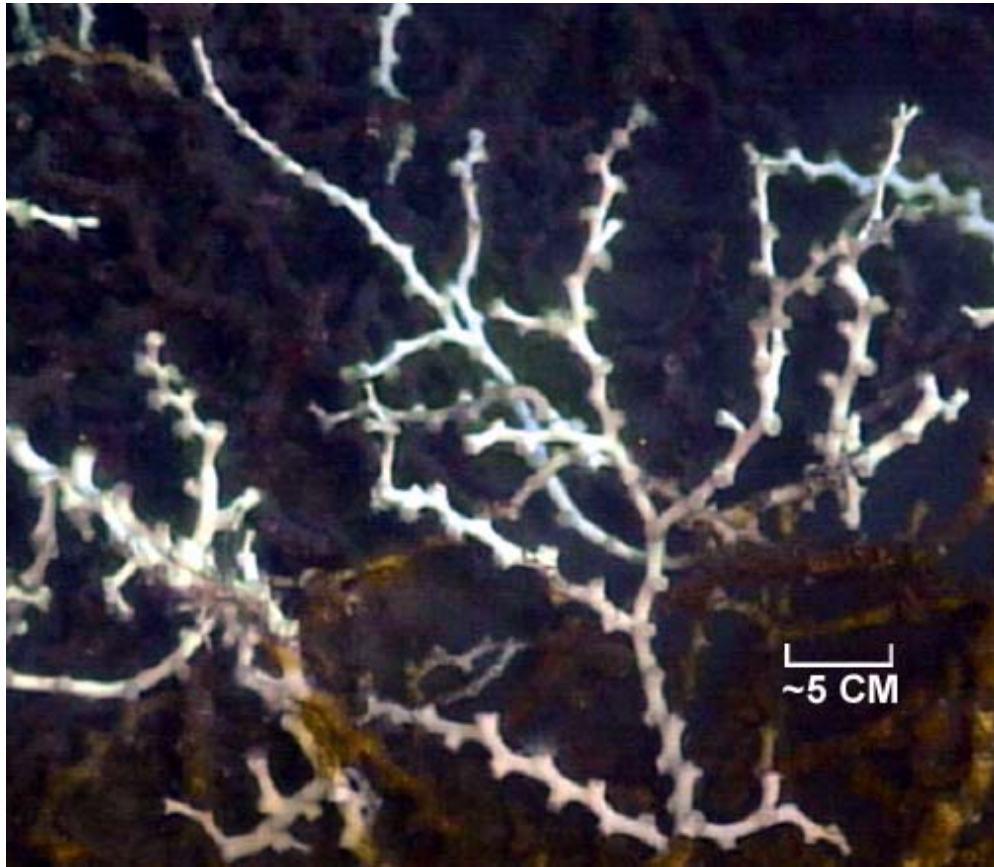


Figure 8. Live *Lophelia* colonies observed in the VK 826 area, during dive USGS-GM-2004-03-JSL-4751.



agar. Also, several of the samples from both dives yielded opaque, off-white colonies on seawater medium after incubating for approximately one week at 4°C. This may be a monoculture, but this preliminary indicator cannot be confirmed until DNA identifications are completed.

Genetic Samples

Tissue samples were taken from 36 *Lophelia* specimens, three black corals, two octocorals, and three squat lobster, *Eumunida picta* (Appendix I, Table 11). Tissue samples were preserved for DNA and RNA extraction by placement on FTA cards, and in 95% absolute alcohol, DMSO, and/or RNA later. Photographs and dry skeleton samples (to serve as voucher specimens) were taken for most specimens. Several live specimens, taken from Kellogg's samples from dive USGS-GM-2004-03-JSL-4746, were successfully transferred to an aquarium maintained in a walk-in cooler. The microbe sampling device allows live bottom-to-surface transport of *Lophelia pertusa*.

Stable Isotopes

Three hundred and seventy-five stable isotope samples were collected from flora and faunal sources during the cruise (Appendix I, Table 12). Samples

were taken from 23 fish and 10 invertebrate species. Three phytoplankton and zooplankton samples were taken as well. During the cruise, multiple patches of *Sargassum* were sampled via dipnet. Isotope samples were taken of the leaves along with crab and shrimp species living within the algal matrix. Decaying water hyacinth was found mixed into the patches, presumably originating from the Mississippi River outflow. Additional samples were taken of this freshwater species for comparative purposes.

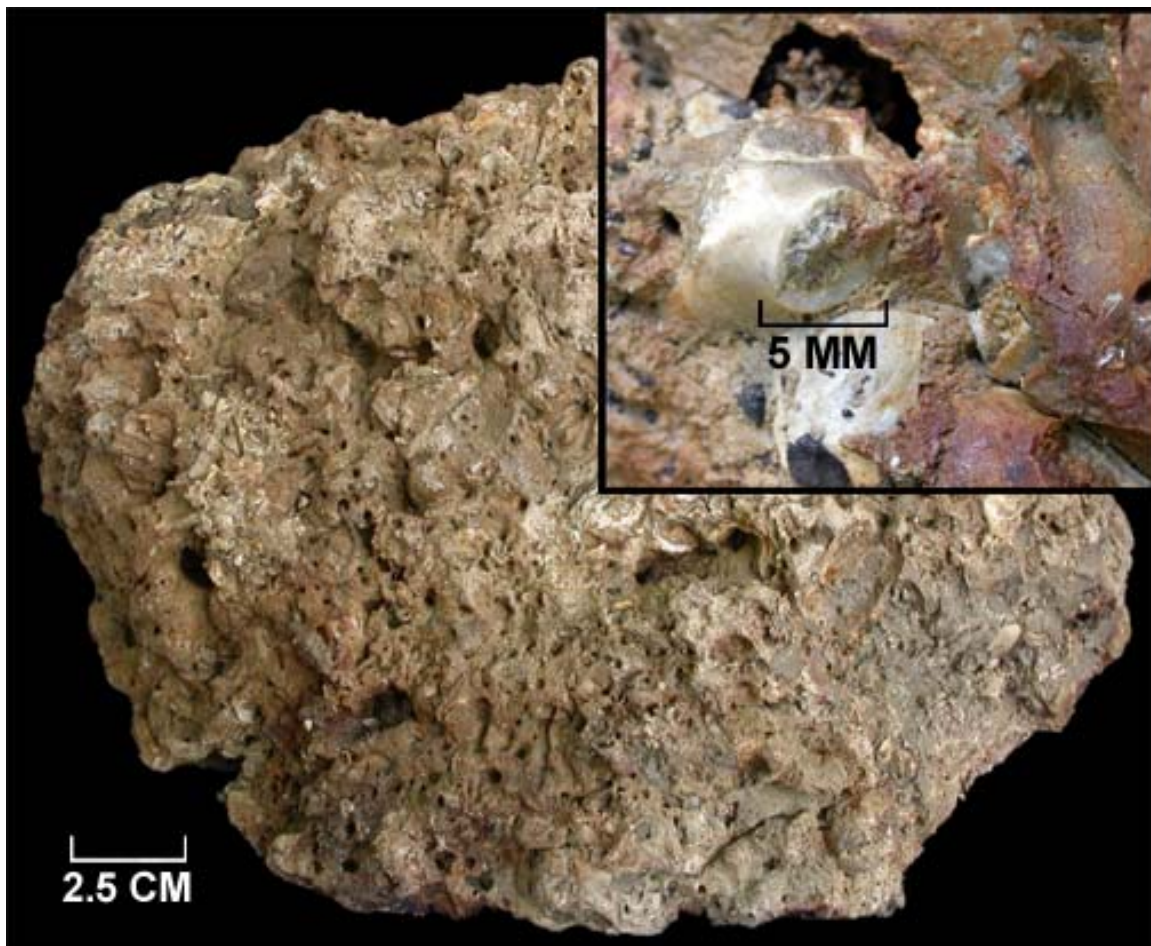
Paleo-ecology

Fourteen coral samples were collected for paleo-analysis during the cruise. Samples for aging were taken from black corals, octocorals, and *Lophelia* (Appendix I, Table 13). Live *Lophelia* and rubble was also sampled for microscopic analysis (Figure 9). Additionally, several large rocks were collected (Figure 10). The rocks appear to be conglomerates of *Lophelia* rubble based upon external analysis and density estimates. No settled coral larvae were observed on the rock samples.

Figure 9. A fan-shaped piece of *Lophelia pertusa*.



Figure 10. A) Conglomerate rock containing *Lophelia* rubble collected during dive USGS-GM-2004-03-JSL-4752. (Insert shows *Lophelia* branch within rock)



Water Chemistry

At the time of sampling, outflow from the Mississippi River had a major influence on the surface water parameters (Figures 11 & 12, Appendix II). Salinity plots display a surface water mass which is less saline with evidence of the water mass mixing to a depth of 40-50 m. Below the 40-50 m mark, the salinity stabilizes between 35 to 36 (PSU). During most dives, bottom conditions were fairly homogeneous, however during two (USGS-GM-2004-03-JSL-4744 & 4747) of the dives, the bottom condition displayed some variance (Appendix II). For example, during dive USGS-GM-2004-03-JSL-4744 the temperature varied by 3°C, oxygen concentration varied by 0.4 ppm, and salinity varied by 0.7 PSU (Figure 12). This could be an indication of dynamic water mass exchange along the bottom topography.

Figure 11. SBE 19+ CTD data from station USGS-GM-2004-03-JSI-4755. The freshwater lens (B), created by the Mississippi outflow, indicated mixing down to 40-50 meters.

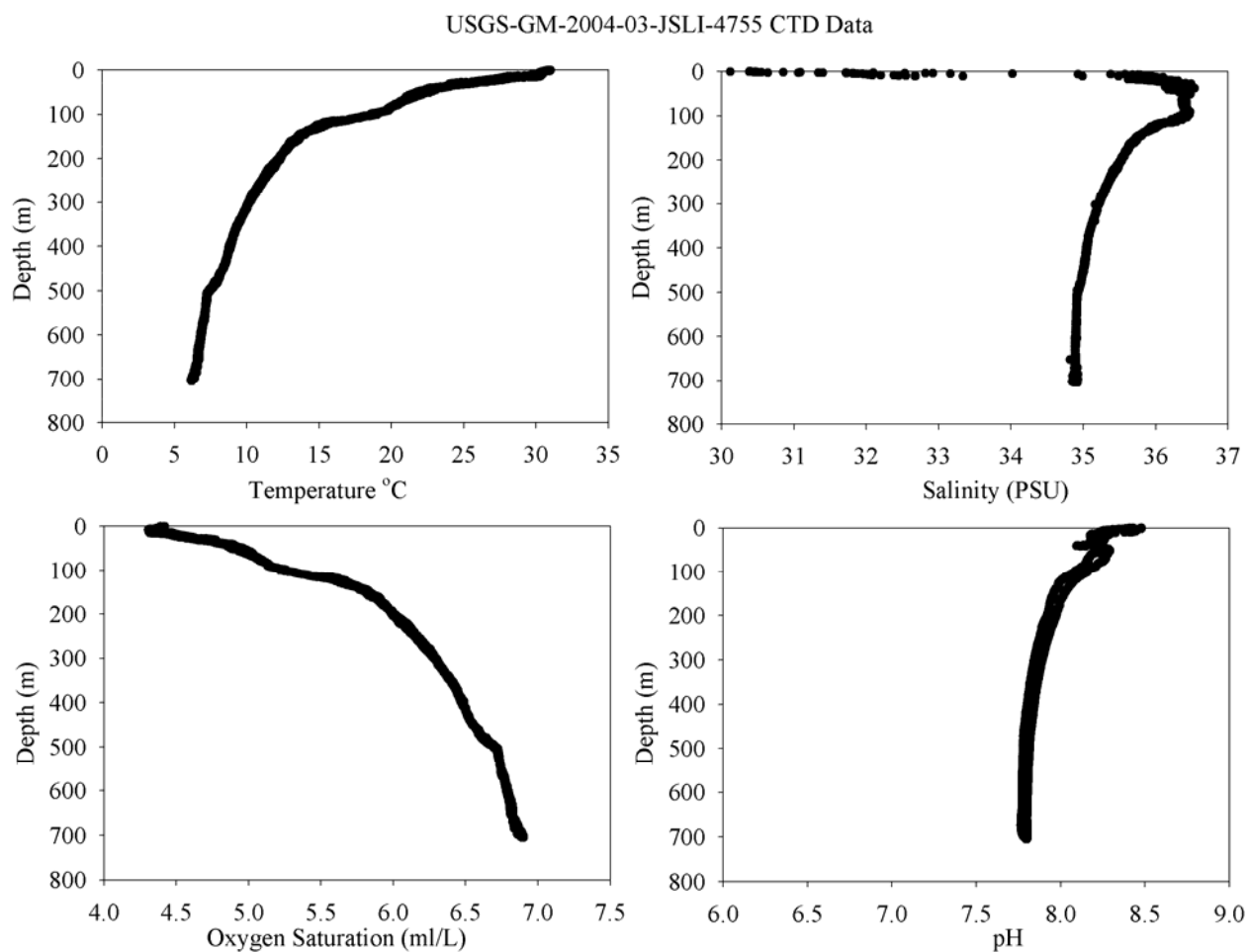
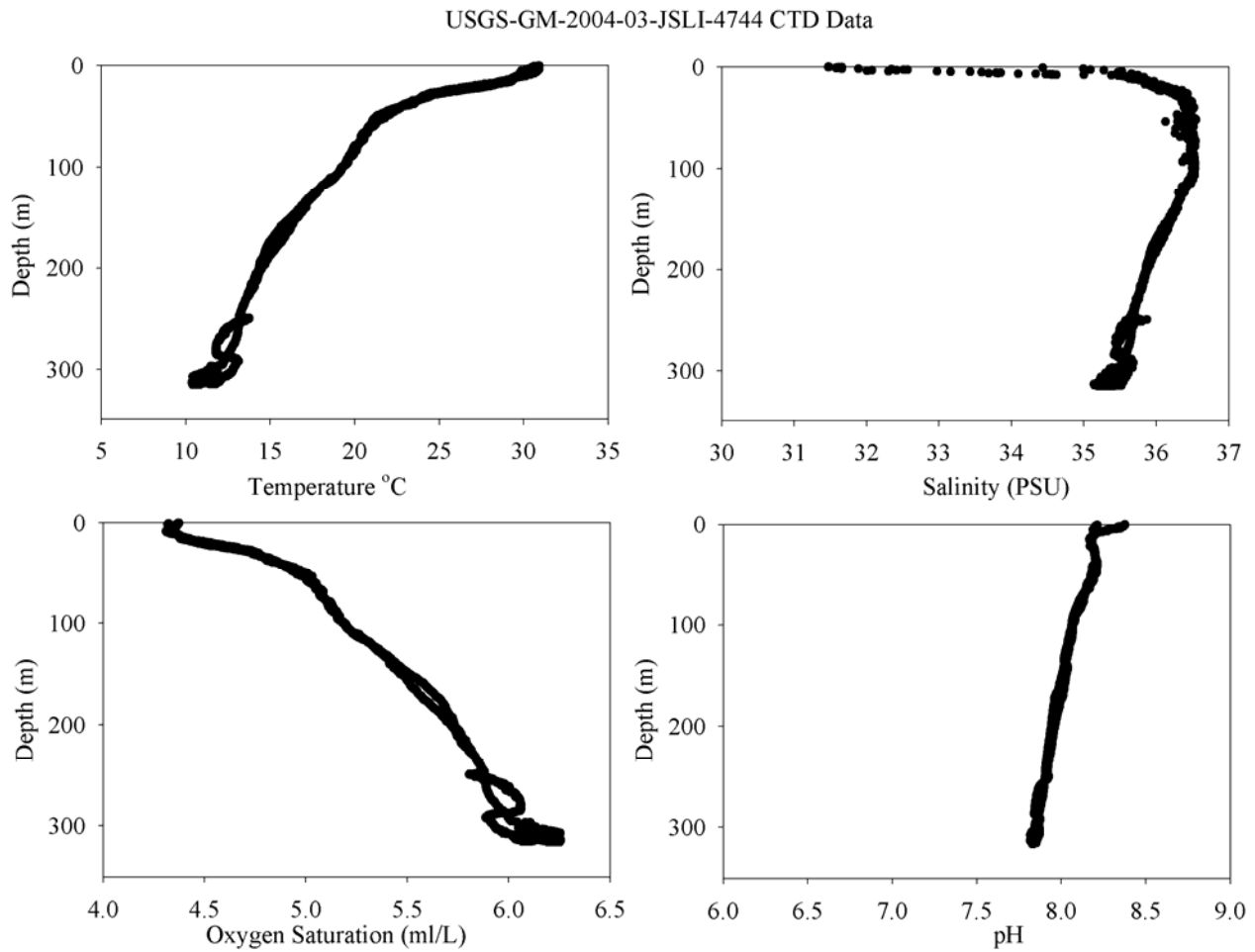


Figure 12. SBE 19+ CTD data from station USGS-GM-2004-03-JSI-4744. The freshwater lens (B) and the fluctuation in the bottom water layer (A,B,C) are evident.



METADATA AND STATUS

GIS Data

The master geographic information database in ArcGIS 8 format is located at the USGS-Florida Integrated Science Center, Gainesville, Florida. The database requires 1.25 GB for storage. The information contained in the GIS log will be analyzed to define the cruise track and submersible dive tracks.

Echosounder Data

Print-outs of the echosounder transects and paper log are located at the USGS-Florida Integrated Science Center, Gainesville, Florida.

Video and Digital Still Images

The submersible collected video is in two formats, miniDV tapes and duplicated DVDs. The digital still shots are in TIF format and require 1.4GB for storage. The video and images are stored at the USGS-Florida Integrated Science Center, Gainesville, Florida. A back-up copy of the miniDV recorded video is located at the University of North Carolina – Wilmington with Dr. Ross. Video analysis of fish and invertebrate habitat use is ongoing.

Audio Data

The master audiolog in digital format and transcribed paper logs are located at the USGS-Florida Integrated Science Center, Gainesville, Florida.

Fish Specimens

The master specimen log, preserved photo and non-photo specimens, and collected stomachs are located at the USGS-Florida Integrated Science Center, Gainesville, Florida. Analysis of gut contents is ongoing.

Invertebrate Specimens

The master specimen log, preserved photo and non-photo specimens are presently located at the USGS-Florida Integrated Science Center, Gainesville, Florida. The benthic infauna will remain with the USGS and the samples will be rough sorted at the FISC laboratory with organisms identified to taxon and a dry weight biomass taken. Macroepifaunal invertebrates will be transferred to Dr. Nizinski at the NMFS lab in the Smithsonian Institution for taxonomic identification. Crinoids may be reserved for a taxonomic specialist at Nova-Southeastern University.

Microbial Data

The master log and microbial specimens are located at the USGS-Florida Integrated Science Center, St. Petersburg, Florida. Microbial analysis of the collected samples is ongoing.

Genetics Data

The master log and coral genetics specimens are located at the USGS-Leetown Center, Leetown, VA. Genetic analysis of the collected samples is ongoing.

Paleo-ecology Data

The master log, coral aging specimens, and paleo-ecological specimens are located at McMaster University with Dr. Risk.

Stable Isotope Data

The master log containing all isotope sample information is located at the USGS-Florida Integrated Science Center, Gainesville, Florida. The samples have been dried, weighed, and plated. Analysis will be performed at the University of California, Davis.

Paleo-ecological Data

The master log and paleo-ecological specimens are located at McMaster University and the University of Montreal-Quebec with Dr. Risk. Paleoecological analysis is ongoing.

Water Chemistry Data

The master log, containing all water parameter data, is located at the USGS-Florida Integrated Science Center, Gainesville, Florida.

REFERENCES

Continental Shelf Associates, Inc. 2003. Characterization of northern Gulf of Mexico deepwater hard bottom communities with emphasis on *Lophelia* Coral. Technical Proposal. Solicitation No. 1435-01-03-RP-72323.

Sulak, K.J. 2004. *Lophelia* reef fish & mobile megafauna community structure, biotope affinities and trophodynamics. Synoptic Technical Study Plan. USGS Florida Integrated Science Center, CARS, Gainesville, Florida. (available at <http://cars.er.usgs.gov/coastaleco/>)

APPENDIX I

Tables 1 – 13

Table 1. Cruise USGS-GM-2004-03 Scientific Research Team

Table 2. Cruise USGS-GM-2004-03 Gulf of Mexico *Lophelia* Cruise Station Data Summary Sheet

Table 3. Synopsis of Submersible Station Data for Cruise USGS-GM-2004-03

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

Table 5. Cruise USGS-GM-2004-03 Submersible Dive External Digital Still Photograph Synopsis

Table 6. Cruise USGS-GM-2004-03 Fish Specimens Collected

Table 7. Cruise USGS-GM-2004-03 Fish Stomach Content Collections Accomplished for Trophic Analyses

Table 8. Cruise USGS-GM-2004-03 Species Documentation via Digital Layout Imaging

Table 9. Cruise USGS-GM-2004-03 Invertebrate Collections

Table 10. Cruise USGS-GM-2004-03 Sediment Sample Collections

Table 11. Cruise USGS-GM-2004-03 Data Pertaining to Genetic Samples Obtained by Morrison, King, & Shill

Table 12. Cruise USGS-GM-2004-03 Synopsis of Stable Isotope Tissue Sampling for Trophodynamic Forensics

Table 13. Cruise USGS-GM-2004-03 Coral Collections taken for Coral Age, Paleoecology, and Paleoclimate Forensics.

Table 1. Cruise USGS-GM-2004-03 Scientific Research Team

Name	Title	Address	E-mail	Telephone	Fax	Responsibility
Dr. R. Allen Brooks	Estuarine Ecologist	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	allen_brooks@usgs.gov	(352) 264-3478	(352) 378-5763	Co-PI, Scientific Party Chief - Macrofaunal/ Meiofaunal Invertebrate Specialist
Dr. John Caruso	Fish Biologist	Department of Biological Science University of New Orleans 2000 Lakeshore Dr. New Orleans, LA 70148-2960	jcaruso@uno.edu	(504) 280-5440		Fish Identification, Layout Photography
William M. Harden	Fishery Biotechnician	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	bill_harden@usgs.gov	(352) 264-3488	(352) 378-5763	USGS/CEC - Remote Sampling Operations; Photo Specimen Prep
Steve Hartley	Geographer	USGS - BRD - NWRC National Wetlands Research Center 700 Cajundome Blvd. Lafayette, LA 70506	steve_hartley@usgs.gov	(337) 266-8543	(337) 266-8616	GIS Expert
S. Conor Keitzer	Fishery Biotechnician	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	steven_keitzer@usgs.gov	(352) 378-8181	(352) 378-5763	USGS/CEC - Remote Sampling Operations; Isotope Prep
Dr. Christina Kellogg	Microbiologist	USGS Center for Coastal Watershed Studies 600 4th St. South Petersburg, FL 33701	ckellogg@usgs.gov	(727) 803-8747 ext. 3128	(727) 803-2031	CCES Lead PI - Coral Microbes
Dr. Tim King	Research Fishery Biologist	USGS Leetown Science Center Aquatic Ecology Lab 11649 Leetown Rd. Kearneysville, WV 25430	tim_king@usgs.gov	(304) 724-8340 ext. 2142	(304) 725-0351	LSC Lead PI - Coral Genetics
Dr. Cheryl Morrison	Biologist	USGS Leetown Science Center Aquatic Ecology Lab 11649 Leetown Rd. Kearneysville, WV 25430	cheryl_morrison@usgs.gov	(304) 724-4464	(304) 724-4465	Coral Genetics; Daily Log Coordinator
Dr. Martha Nizinski	Zoologist	NOAA/NMFS Systematics Lab Smithsonian Institution P.O. Box 37012 NHB-WC-57, MRC 153 Washington, DC 20017	nizinski.martha@nmnh.si.edu	(202) 357-2639	(202) 357-2986	Co-PI - Crustacean Specialist

Name	Title	Address	E-mail	Telephone	Fax	Responsibility
Andrew J. Quaid	Chemical Oceanographer	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	andrew_quaid@usgs.gov	(352) 264-3523	(352) 378-5763	USGS/CEC - GIS, Mapping, CTD Operations, Data Management Chief
Michael Randall	Senior Fishery Biologist	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	mike_randall@usgs.gov	(352) 264-3521	(352) 378-5763	USGS/CEC - Remote Sampling Operations; Isotope Prep
Prof. Mike Risk	Professor Emeritus of Geology and Biology	Mail: P.O. Box 1195 Durham, ON, Canada NOG IRO Courier: 383766 Conc. 4, Glenelg Priceville, ON, Canada NOK ICO	riskmj@univmail.cis.mcmaster.ca	(905) 525-9140 ext. 24183		Co-PI - Coral Aging, Specimen Prep.
Jason Rochelo	Fishery Biotechnician	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	jason_rochelo@usgs.gov	(352) 378-8181	(352) 378-5763	USGS/CEC - Data Management Assistant; Image Organization
Dr. Steve W. Ross	Research Fish Biologist	UNCW/CMS 5600 Marvin Moss Ln. Wilmington, NC 28409	rosss@uncw.edu	(910) 395-3905	(910)395-3942	Co-PI - Fish Taxonomy and Distribution Specialist; Mini-DV and DVD Copying Coordinator
W. Bane Schill	Research Chemist	USGS Leetown Science Center Aquatic Ecology Lab 11649 Leetown Rd. Kearneysville, WV 25430	bane_schill@usgs.gov	(304) 724-4438	(304) 724-4435	Coral Genetics
Dr. Kenneth J. Sulak	Research Fish Biologist	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	ken_sulak@usgs.gov	(352) 264-3500	(352) 378-4956	Chief Scientist, CEC Lead PI - Overall Mission Organization; Digital Image Capture and Vouchering
Branwen Williams	Graduate Student	Centre - GEOTOP - UQAM - McGill Pavillon President - Kennedy 201, Au President - Kennedy Room Pk - 7150 Montreal, Quebec, Canada H2X 3Y7	branwen01@yahoo.ca	(514) 490-9191	williams.branwen@courrier.uqam.ca	Coral Aging
George Yeargin	Master Biotechnician	USGS/FISC 7920 NW 71st Street Gainesville, FL 32653	retired	retired	retired	USGS/CEC - Remote Sampling Operations; Safety Officer

Table 2. Cruise USGS-GM-2004-03 Gulf of Mexico Lophelia Cruise Station Data Summary Sheet

Station Number	Date	Time	Site Name	Latitude N	Longitude W	Primary Tasks
JSL-2004-03-4744	30-Jul-04	8:49	Viosca Knoll 906-907	29 06.4075	88 23.0410	Fish Traps, Video, Photos, Coral, Sediment, Fish collections
SJII-2004-03-9001	30-Jul-04	13:19	Viosca Knoll 906-907	29 06.246	88 22.759	Plankton Net, Surface
SJII-2004-03-9002	30-Jul-04	13:42	Viosca Knoll 906-907	29 06.509	88 23.224	Plankton Net, 38 m
SJII-2004-03-9003	30-Jul-04	14:07	Viosca Knoll 906-907	29 06.829	88 23.810	Plankton Net, 35 m
JSL-2004-03-4745	30-Jul-04	16:44	Viosca Knoll 906-907	29 05.8510	88 23.1400	MMS Traps, Rock, Fish, Invert, Video, Photo collections
SJII-2004-03-9004	30-Jul-04	23:04	Viosca Knoll 906-907	29 05.586	88 29.785	Trawl (3.7 m)
SJII-2004-03-9005	31-Jul-04	6:27	Viosca Knoll 906-907	29 6.4123	88 22.967	Longline
JSL-2004-03-4746	31-Jul-04	7:55	Viosca Knoll 906-907	29 06.3638	88 22.9857	Lophelia, Kellogg sampler, Fish Traps, Video, Photos collections
SJII-2004-03-9006	31-Jul-04	13:05	Viosca Knoll 906-907	29 06.426	88 23.052	Longline
JSL-2004-03-4747	31-Jul-04	15:54	Viosca Knoll 906-907	29 06.4278	88 23.0584	Sediment, Lophelia, Fish Collections & Imaging
SJII-2004-03-9007	31-Jul-04	22:18	Viosca Knoll 906-907	29 03.268	88 22.137	Trawl (3.7 m)
JSL-2004-03-4748	1-Aug-04	7:54	Viosca Knoll 826	29 09.6906	88 01.0533	Lophelia, Sediment, Fish Traps, Invert, Lophelia, Video and photo collections
SJII-2004-03-9008	1-Aug-04	8:00	Viosca Knoll 826	29 09.719	88 00.978	Dipnet
SJII-2004-03-9009	1-Aug-04	9:45	Viosca Knoll 826	29 09.636	88 01.048	Dipnet
SJII-2004-03-9010	1-Aug-04	10:08	Viosca Knoll 826	29 09.699	88 01.075	Dipnet
SJII-2004-03-9011	1-Aug-04	10:34	Viosca Knoll 826	29 09.529	88 01.043	Dipnet
SJII-2004-03-9012	1-Aug-04	12:00	Viosca Knoll 826	29 08.514	88 00.024	Trolling
JSL-2004-03-4749	1-Aug-04	15:42	Viosca Knoll 826	29 09.3938	88 01.1202	MMS Sampler Deployment, Sediment, Lophelia, Invert, Video, Photo collections
SJII-2004-03-9013	1-Aug-04	21:35	Viosca Knoll 826	29 10.977	88 01.951	Benthic Sled
SJII-2004-03-9014	2-Aug-04	1:47	Viosca Knoll 826	29 11.454	88 04.693	Benthic Sled
SJII-2004-03-9015	2-Aug-04	4:24	Viosca Knoll 826	29 09.593	88 03.174	CTD
SJII-2004-03-9016	2-Aug-04	4:56	Viosca Knoll 826	29 09.776	88 02.732	Plankton Net, 100 m
JSL-2004-03-4750	2-Aug-04	7:54	Viosca Knoll 826	29 10.3800	88 01.0700	Invert, Fish, Sediment, Coral, Video, Photo collections
JSL-2004-03-4751	2-Aug-04	15:26	Viosca Knoll 826	29 10.1810	88 00.7640	Lophelia, Yeargin Coral Sampler, Fish, Invert, Sponge, Video, Photo Collections
SJII-2004-03-9017	2-Aug-04	20:30	South of Ludwig & Walton	29 13.347	87 52.337	Trawl (3.7 m)
SJII-2004-03-9018	2-Aug-04	23:13	South of Ludwig & Walton	29 15.118	87 52.150	Trawl (3.7 m)
SJII-2004-03-9019	3-Aug-04	1:44	South of Ludwig & Walton	29 16.747	87 47.257	CTD
JSL-2004-03-4752	3-Aug-04	7:53	Viosca Knoll 826	29 10.1810	88 00.7460	Lophelia, Coral, Fish, Egg Case, Sponge, Rock, Video, Photo Collections
JSL-2004-03-4753	3-Aug-04	15:43	Viosca Knoll 826	29 10.1810	88 00.7640	Invert, Lophelia, Kellogg sampler, Video, Photo Collections
SJII-2004-03-9020	3-Aug-04	19:06	CEC 4	29 10.110	88 00.530	Dipnet
SJII-2004-03-9021	3-Aug-04	12:30	Viosca Knoll 826	29 09.973	87 59.262	Trolling/ 4 rods, Note: Actual station occurred before SJII-2004-03-9021
JSL-2004-03-4754	4-Aug-04	7:50	CEC 4	29 26.9300	88 57.7370	Fish, Inverts, Video, Photo Collections
JSL-2004-03-4755	4-Aug-04	15:21	CEC 5	29 23.3930	86 58.8000	Inverts, Fish, Video, Photo Collections

KEY: JSL = DSRV Johnson-Sea-Link submersible; SJII = RV Seward Johnson II

Table 3. Synopsis of Submersible Station Data for Cruise USGS-GM-2004-03

			Scientist		Bottom Time (CDT)		Depth (ft)		Temperature (°C)			Bottom Salinity (ppt)		
JSL Dive #	Site Name	Date	Fore	Aft	Start	Stop	Start	Stop	Start	Stop	Salinity at Surface	Start	Stop	Objectives*
4744	Viosca Knoll 906-907	7/30/2004	Sulak	Brooks	9:20:05	12:04:52	1035	1020	11.16	1018		35.36	35.29	multiple
4745	Viosca Knoll 906-907	7/30/2004	Ross	Risk	17:18:32	19:55:08	1103	1083	10.89	10.75		35.32	35.3	multiple
4746	Viosca Knoll 906-907	7/31/2004	Nizinski	Kellogg	8:27:06	10:29:06	1123	1026	10.23	10.6		35.21	35.28	coral microbe & RNA collecting
4747	Viosca Knoll 906-907	7/31/2004	Brooks	Schill	No display	No display	1039	1025	11.21	10.7		35.38	35.3	multiple
4748	Viosca Knoll 826	8/1/2004	King	Sulak	8:30:54	10:55:22	1462	1452	8.67	8.56		35.04	35.02	multiple
4749	Viosca Knoll 826	8/1/2004	Morrison	Nizinski	16:12:11	18:42:51	1559	1428	8.15	8.44		34.97	35	deploy MMS samplers & genetics
4750	Viosca Knoll 826	8/2/2004	Caruso	Ross	8:29:20	11:01:20	1735	1663	7.83	7.67	36.42(380 ft)	34.96	34.94	multiple

Table 3. Synopsis of Submersible Station Data for Cruise USGS-GM-2004-03

			Scientist		Bottom Time (CDT)		Depth (ft)		Temperature (°C)			Bottom Salinity (ppt)		
JSL Dive #	Site Name	Date	Fore	Aft	Start	Stop	Start	Stop	Start	Stop	Salinity at Surface	Start	Stop	Objectives*
4751	Viosca Knoll 826	8/2/2004	Williams	Quaid	15:57:50	18:44:08	1513	1468	8.18	8.73		34.99	35.04	multiple
4752	Viosca Knoll 826	8/3/2004	Risk	Ross	8:28:06	11:09:17	1543	1521	8.09	7.91	36.43(149 ft)	34.97	34.96	multiple
4753	Viosca Knoll 826	8/3/2004	Kellogg	Nizinski	16:17:45	18:57:27	1549	1452	7.74	8.04		34.96	34.97	coral microbe & RNA collecting
4754	CEC 4	8/4/2004	King	Sulak	8:32:19	11:04:58	2426	1875	5.98	6.99		34.9	34.9	site exploration & imaging
4755	CEC 5	8/4/2004	Randall	Shill	15:57:39	18:29:51	2305	2103	6.27	6.73	36.38(306 ft)	34.89	34.89	site exploration & imaging

* multiple objectives = coral, megafauna, and sediment collecting and imaging

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4744	Mini DV	7/30/2004	Viosca Knoll 906-907	9:20:05	10:18:11	Sulak	1 of 3	0:58:05	0:00:00	0:58:05	Sulak	Brooks
4744	Mini DV	7/30/2004	Viosca Knoll 906-907	10:18:55	11:20:48	Sulak	2 of 3	1:01:57	0:00:00	1:01:57	Sulak	Brooks
4744	Mini DV	7/30/2004	Viosca Knoll 906-907	11:22:46	12:04:52	Sulak	3 of 3	0:42:11	0:00:00	0:42:11	Sulak	Brooks
						Total Dive Tape Time		2:42:13				
4744	S-digi	7/30/2004	Viosca Knoll 906-907	9:20:14	10:18:01	Sulak	1 of 3	0:57:47	0:00:00	0:57:47	Sulak	Brooks
4744	S-digi	7/30/2004	Viosca Knoll 906-907	10:19:54	11:20:52	Sulak	2 of 3	1:00:58	0:00:00	1:00:58	Sulak	Brooks
4744	S-digi	7/30/2004	Viosca Knoll 906-907	11:22	12:07:23	Sulak	3 of 3	0:44:46	0:00:00	0:44:46	Sulak	Brooks
						Total Dive Tape Time		2:43:31				
4744	Int-Stern	7/30/2004	Viosca Knoll 906-907	Not Avail.	Not Avail.	Sulak	1 of 3	0:59:51	0:00:00	0:59:51	Sulak	Brooks

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4744	Int-Stern	7/30/2004	Viosca Knoll 906-907	Not Avail.	Not Avail.	Sulak	2 of 3	0:58:38	0:00:00	0:58:38	Sulak	Brooks
4744	Int-Stern	7/30/2004	Viosca Knoll 906-907	Not Avail.	Not Avail.	Sulak	3 of 3	0:48:50	0:00:00	0:48:50	Sulak	Brooks
						Total Dive Tape Time		2:47:19				
4745	Mini DV	7/30/2004	Viosca Knoll 906-907	17:18:32	18:16:31	Ross	1 of 3	0:58:16	0:00:00	0:58:16	Ross	Risk
4745	Mini DV	7/30/2004	Viosca Knoll 906-907	19:45:47	19:45:53	Ross	2 of 3	0:00:07	0:00:00	0:00:07	Ross	Risk
4745	Mini DV	7/30/2004	Viosca Knoll 906-907	19:47:39	19:55:08	Ross	3 of 3	0:07:33	0:00:00	0:07:33	Ross	Risk
						Total Dive Tape Time		1:05:56				
4745	S-digi	7/30/2004	Viosca Knoll 906-907	17:18:27	18:16:42	Ross	1 of 3	0:58:15	0:00:00	0:58:15	Ross	Risk
4745	S-digi	7/30/2004	Viosca Knoll 906-907	18:17:00	19:19:40	Ross	2 of 3	1:02:40	0:00:00	1:02:40	Ross	Risk

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4745	S-digi	7/30/2004	Viosca Knoll 906-907			Ross	3 of 3	0:01:24	0:00:00	0:01:24	Ross	Risk
						Total Dive Tape Time		2:02:19				
4745	Int-Bow	7/30/2004	Viosca Knoll 906-907	17:07:02	18:05:14	Ross	1 of 3	0:58:12	0:00:00	0:58:12	Ross	Risk
4745	Int-Bow	7/30/2004	Viosca Knoll 906-907	18:06:02	19:04:14	Ross	2 of 3	0:58:18	0:00:00	0:58:18	Ross	Risk
4745	Int-Bow	7/30/2004	Viosca Knoll 906-907	19:05:32	19:57:47	Ross	3 of 3	0:52:15	0:00:00	0:52:15	Ross	Risk
						Total Dive Tape Time		2:48:45				
4746	Mini DV	7/31/2004	Viosca Knoll 906-907	8:27:06	9:25:01	Nizinski	1 of 2	0:57:08	0:00:00	0:57:08	Nizinski	Kellogg
4746	Mini DV	7/31/2004	Viosca Knoll 906-907	9:26:49	10:29:06	Nizinski	2 of 2	1:02:29	0:00:00	1:02:29	Nizinski	Kellogg
						Total Dive Tape Time		1:59:37				

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4746	S-digi	7/31/2004	Viosca Knoll 906-907	No Sound	No Sound	Nizinski	1 of 3	0:59:01	0:00:00	0:59:01	Nizinski	Kellogg
4746	S-digi	7/31/2004	Viosca Knoll 906-907	No Sound	No Sound	Nizinski	2 of 3	1:02:40	0:00:00	1:02:40	Nizinski	Kellogg
4746	S-digi	7/31/2004	Viosca Knoll 906-907	No Sound	No Sound	Nizinski	3 of 3	0:51:53	0:00:00	0:51:53	Nizinski	Kellogg
						Total Dive Tape Time		2:53:34				
4746	Int-Bow	7/31/2004	Viosca Knoll 906-907	8:25:58	9:25:18	Nizinski	1 of 2	0:59:20	0:00:00	0:59:20	Nizinski	Kellogg
4746	Int-Bow	7/31/2004	Viosca Knoll 906-907	10:06:02	11:08:07	Nizinski	2 of 2	1:02:05	0:00:00	1:02:05	Nizinski	Kellogg
						Total Dive Tape Time		2:01:25				
4746	Int-Stern	7/31/2004	Viosca Knoll 906-907	8:57:23	9:22:33	Nizinski	1 of 1	0:23:10	0:00:00	0:23:10	Nizinski	Kellogg
						Total Dive Tape Time		0:23:10				

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4747	Mini DV	7/31/2004	Viosca Knoll 906-907	16:19:56	17:17:50	Brooks	1 of 3	0:57:54	0:00:00	0:57:54	Brooks	Schill
4747	Mini DV	7/31/2004	Viosca Knoll 906-907	17:19:10	18:16:54	Brooks	2 of 3	0:57:44	0:00:00	0:57:44	Brooks	Schill
4747	Mini DV	7/31/2004	Viosca Knoll 906-907	18:19:03	19:20:12	Brooks	3 of 3	1:01:09	0:00:00	1:01:09	Brooks	Schill
						Total Dive Tape Time		2:56:47				
4747	S-digi	7/31/2004	Viosca Knoll 906-907	16:19:55	17:18:28	Brooks	1 of 3	0:58:33	0:00:00	0:58:33	Brooks	Schill
4747	S-digi	7/31/2004	Viosca Knoll 906-907	17:19:10	18:17:37	Brooks	2 of 3	0:58:27	0:00:00	0:58:27	Brooks	Schill
4747	S-digi	7/31/2004	Viosca Knoll 906-907	18:18:59	19:20:39	Brooks	3 of 3	1:01:40	0:00:00	1:01:40	Brooks	Schill
						Total Dive Tape Time		2:58:40				
4747	Int-Bow	7/31/2004	Viosca Knoll 906-907	16:21:31	17:17:38	Brooks	1 of 3	0:56:07	0:00:00	0:56:07	Brooks	Schill

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4747	Int-Bow	7/31/2004	Viosca Knoll 906-907	17:18:11	18:09:17	Brooks	2 of 3	0:51:06	0:00:00	0:51:06	Brooks	Schill
4747	Int-Bow	7/31/2004	Viosca Knoll 906-907	18:18:22	19:18:28	Brooks	3 of 3	1:00:06	0:00:00	1:00:06	Brooks	Schill
						Total Dive Tape Time		2:47:19				
4747	Int-Stern	7/31/2004	Viosca Knoll 906-907	Not. Avail.	Not. Avail.	Brooks	1 of 1	0:06:21	0:00:00	0:06:21	Brooks	Schill
						Total Dive Tape Time		0:06:21				
4748	Mini DV	8/1/2004	Viosca Knoll 826	8:30:54	9:31:50	King	1 of 3	0:57:29	0:00:00	1:00:48	King	Sulak
4748	Mini DV	8/1/2004	Viosca Knoll 826	9:32:26	10:29:57	King	2 of 3	0:57:29	0:00:00	0:57:29	King	Sulak
4748	Mini DV	8/1/2004	Viosca Knoll 826	10:31:12	10:55:22	King	3 of 3	0:24:08	0:00:00	0:24:08	King	Sulak
						Total Dive Tape Time		2:19:06				
4748	S-digi	8/1/2004	Viosca Knoll 826	8:18:03	9:17:43	King	1 of 3	0:59:40	0:00:00	0:59:40	King	Sulak
4748	S-digi	8/1/2004	Viosca Knoll 826	9:32:17	10:29:52	King	2 of 3	0:57:35	0:00:00	0:57:35	King	Sulak

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4748	S-digi	8/1/2004	Viosca Knoll 826	10:31:06	10:40:44	King	3 of 3	0:09:38	0:00:00	0:24:22	King	Sulak
						Total Dive Tape Time		2:06:53				
4748	Int-Bow	8/1/2004	Viosca Knoll 826	Not. Avail.	Not. Avail.	King	1 of 1	0:33:38	0:00:00	0:33:38	King	Sulak
						Total Dive Tape Time		0:33:38				
4748	Int-Stern	8/1/2004	Viosca Knoll 826	Not. Avail.	Not. Avail.	King	1 of 1	0:09:38	0:00:00	0:09:38	King	Sulak
						Total Dive Tape Time		0:09:38				
4749	Mini DV	8/1/2004	Viosca Knoll 826	16:12:11	17:11:57	Morrison	1 of 3	0:59:46	0:00:00	0:59:46	Morrison	Nizinski
4749	Mini DV	8/1/2004	Viosca Knoll 826	17:15:52	18:14:24	Morrison	2 of 3	0:58:33	0:00:00	0:58:33	Morrison	Nizinski
4749	Mini DV	8/1/2004	Viosca Knoll 826	18:15:44	18:42:51	Morrison	3 of 3	0:27:08	0:00:00	0:27:08	Morrison	Nizinski
						Total Dive Tape Time		2:25:27				
4749	S-digi	8/1/2004	Viosca Knoll 826	16:12:11	17:14:32	Morrison	1 of 3	1:02:21	0:00:00	1:02:21	Morrison	Nizinski

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4749	S-digi	8/1/2004	Viosca Knoll 826	Not. Avail.	Not. Avail.	Morrison	2 of 3	1:00:40	0:00:00	1:00:40	Morrison	Nizinski
4749	S-digi	8/1/2004	Viosca Knoll 826	18:15:35	18:42:50	Morrison	3 of 3	0:27:15	0:00:00	0:27:15	Morrison	Nizinski
						Total Dive Tape Time		2:30:16				
4749	Int-Bow	8/1/2004	Viosca Knoll 826	16:14:03	17:12:28	Morrison	1 of 3	0:58:25	0:00:00	0:58:25	Morrison	Nizinski
4749	Int-Bow	8/1/2004	Viosca Knoll 826	Not. Avail.	Not. Avail.	Morrison	2 of 3	0:58:23	0:00:00	0:58:23	Morrison	Nizinski
4749	Int-Bow	8/1/2004	Viosca Knoll 826	18:13:40	18:32:16	Morrison	3 of 3	0:18:36	0:00:00	0:18:36	Morrison	Nizinski
						Total Dive Tape Time		2:15:24				
4749	Int-Stern	8/1/2004	Viosca Knoll 826	No Sound	No Sound	Morrison	1 of 1	0:11:09	0:00:00	0:11:09	Morrison	Nizinski
						Total Dive Tape Time		0:11:09				
4750	Mini DV	8/2/2004	Viosca Knoll 826	8:29:20	9:27:37	Caruso	1 of 3	0:58:19	0:00:00	0:58:19	Caruso	Ross
4750	Mini DV	8/2/2004	Viosca Knoll 826	9:28:27	10:26:02	Caruso	2 of 3	0:57:35	0:00:00	0:57:35	Caruso	Ross
4750	Mini DV	8/2/2004	Viosca Knoll 826	10:26:33	11:01:20	Caruso	3 of 3	0:34:46	0:00:00	0:34:46	Caruso	Ross

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
						Total Dive Tape Time		2:41:49				
4750	Int-Bow	8/2/2004	Viosca Knoll 826	8:21:04	9:19:02	Caruso	1 of 2	0:57:58	0:00:00	0:57:58	Caruso	Ross
4750	Int-Bow	8/2/2004	Viosca Knoll 826	10:04:52	11:07:26	Caruso	2 of 2	1:02:34	0:00:00	1:02:34	Caruso	Ross
						Total Dive Tape Time		1:02:34				
4750	Int-Stern	8/2/2004	Viosca Knoll 826	8:59:23	9:22:33	Caruso	1 of 1	0:01:38	0:00:00	0:01:38	Caruso	Ross
						Total Dive Tape Time		0:01:38				
4751	Mini DV	8/2/2004	Viosca Knoll 826	15:57:50	16:55:25	Williams	1 of 3	0:57:38	0:00:00	0:57:38	Williams	Quaid
4751	Mini DV	8/2/2004	Viosca Knoll 826	17:07:15	18:06:02	Williams	2 of 3	0:58:46	0:00:00	0:58:46	Williams	Quaid
4751	Mini DV	8/2/2004	Viosca Knoll 826	18:09:28	18:44:08	Williams	3 of 3	0:34:40	0:00:00	0:34:40	Williams	Quaid
						Total Dive Tape Time		2:31:04				
4751	S-digi	8/2/2004	Viosca Knoll 826	15:58:15	17:00:56	Williams	1 of 3	1:02:41	0:00:00	1:02:41	Williams	Quaid
4751	S-digi	8/2/2004	Viosca Knoll 826	17:03:00	18:05:42	Williams	2 of 3	1:02:42	0:00:00	1:02:42	Williams	Quaid

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4751	S-digi	8/2/2004	Viosca Knoll 826	17:59:42	18:42:02	Williams	3 of 3	0:42:20	0:00:00	0:42:20	Williams	Quaid
						Total Dive Tape Time		2:47:43				
4751	Int-Bow	8/2/2004	Viosca Knoll 826	16:00:00	16:58:09	Williams	1 of 3	0:58:09	0:00:00	0:58:09	Williams	Quaid
4751	Int-Bow	8/2/2004	Viosca Knoll 826	17:15:25	18:13:50	Williams	2 of 3	0:58:25	0:00:00	0:58:25	Williams	Quaid
4751	Int-Bow	8/2/2004	Viosca Knoll 826	18:12:38	18:59:42	Williams	3 of 3	0:47:04	0:00:00	0:47:04	Williams	Quaid
						Total Dive Tape Time		2:43:38				
4751	Int-Stern	8/2/2004	Viosca Knoll 826	15:59:38	16:56:32	Williams	1 of 2	0:56:54	0:00:00	0:56:54	Williams	Quaid
4751	Int-Stern	8/2/2004	Viosca Knoll 826	18:23:57	18:35:21	Williams	2 of 2	0:11:24	0:00:00	0:11:24	Williams	Quaid
						Total Dive Tape Time		1:08:18				
4752	Mini DV	8/3/2004	Viosca Knoll 826	8:28:06	9:27:58	Risk	1 of 3	0:59:55	0:00:00	0:59:55	Risk	Ross
4752	Mini DV	8/3/2004	Viosca Knoll 826	9:29:20	10:27:02	Risk	2 of 3	0:58:31	0:00:00	0:58:31	Risk	Ross
4752	Mini DV	8/3/2004	Viosca Knoll 826	10:32:35	11:09:17	Risk	3 of 3	0:36:47	0:00:00	0:36:47	Risk	Ross
						Total Dive Tape Time		2:35:13				

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4752	S-digi	8/3/2004	Viosca Knoll 826	8:28:10	9:28:34	Risk	1 of 3	1:00:24	0:00:00	1:00:24	Risk	Ross
4752	S-digi	8/3/2004	Viosca Knoll 826	9:29:17	10:31:44	Risk	2 of 3	1:02:27	0:00:00	1:02:27	Risk	Ross
4752	S-digi	8/3/2004	Viosca Knoll 826	10:32:19	11:10:11	Risk	3 of 3	0:37:52	0:00:00	0:37:52	Risk	Ross
						Total Dive Tape Time		2:40:43				
4752	Int-Bow	8/3/2004	Viosca Knoll 826	8:39:00	9:41:37	Risk	1 of 3	1:02:37	0:00:00	1:02:37	Risk	Ross
4752	Int-Bow	8/3/2004	Viosca Knoll 826	9:30:07	10:27:50	Risk	2 of 3	0:57:43	0:00:00	0:57:43	Risk	Ross
4752	Int-Bow	8/3/2004	Viosca Knoll 826	10:33:24	11:34:58	Risk	3 of 3	1:01:34	0:00:00	1:01:34	Risk	Ross
						Total Dive Tape Time		3:01:54				
4752	Int-Stern	8/3/2004	Viosca Knoll 826	8:33:01	8:56:00	Risk	1 of 1	0:22:59	0:00:00	0:22:59	Risk	Ross
						Total Dive Tape Time		0:22:59				
4753	Mini DV	8/3/2004	Viosca Knoll 826	16:17:45	17:19:26	Kellogg	1 of 3	1:01:42	0:00:00	1:01:42	Kellogg	Nizinski
4753	Mini DV	8/3/2004	Viosca Knoll 826	17:20:49	18:29:01	Kellogg	2 of 3	1:00:12	0:00:00	1:00:12	Kellogg	Nizinski

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4753	Mini DV	8/3/2004	Viosca Knoll 826	18:23:09	18:57:27	Kellogg	3 of 3	0:34:19	0:00:00	0:34:19	Kellogg	Nizinski
						Total Dive Tape Time		2:36:13				
4753	S-digi	8/3/2004	Viosca Knoll 826	16:18:12	17:20:31	Kellogg	1 of 3	1:02:19	0:00:00	1:02:19	Kellogg	Nizinski
4753	S-digi	8/3/2004	Viosca Knoll 826	17:20:23	18:21:03	Kellogg	2 of 3	1:00:40	0:00:00	1:00:40	Kellogg	Nizinski
4753	S-digi	8/3/2004	Viosca Knoll 826	18:23:07	18:57:41	Kellogg	3 of 3	0:34:34	0:00:00	0:34:34	Kellogg	Nizinski
						Total Dive Tape Time		2:37:33				
4753	Int-Bow	8/3/2004	Viosca Knoll 826	16:18:14	17:19:17	Kellogg	1 of 3	1:01:03	0:00:00	1:01:03	Kellogg	Nizinski
4753	Int-Bow	8/3/2004	Viosca Knoll 826	17:21:11	18:21:08	Kellogg	2 of 3	0:59:57	0:00:00	0:59:57	Kellogg	Nizinski
4753	Int-Bow	8/3/2004	Viosca Knoll 826	18:23:21	18:57:29	Kellogg	3 of 3	0:34:08	0:00:00	0:34:08	Kellogg	Nizinski
						Total Dive Tape Time		2:35:08				
4753	Int-Stern	8/3/2004	Viosca Knoll 826	16:23:51	16:46:54	Kellogg	1 of 1	0:23:03	0:00:00	0:23:03	Kellogg	Nizinski
						Total Dive Tape Time		0:23:03				

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4754	Mini DV	8/4/2004	CEC 4	8:32:19	9:34:39	King	1 of 3	1:02:09	0:00:00	1:02:09	King	Sulak
4754	Mini DV	8/4/2004	CEC 4	9:40:56	10:38:02	King	2 of 3	0:57:05	0:00:00	0:57:05	King	Sulak
4754	Mini DV	8/4/2004	CEC 4	10:38:28	11:04:58	King	3 of 3	0:26:30	0:00:00	0:26:30	King	Sulak
						Total Dive Tape Time		2:25:44				
4754	S-digi	8/4/2004	CEC 4	8:32:21	9:35:03	King	1 of 3	1:02:42	0:00:00	1:02:42	King	Sulak
4754	S-digi	8/4/2004	CEC 4	9:37:22	10:38:28	King	2 of 3	1:01:06	0:00:00	1:01:06	King	Sulak
4754	S-digi	8/4/2004	CEC 4	10:39:07	11:05:01	King	3 of 3	0:25:54	0:00:00	0:25:54	King	Sulak
						Total Dive Tape Time		2:29:42				
4754	Int-Bow	8/4/2004	CEC 4	8:07:45	8:16:09	King	1 of 1	0:08:24	0:00:00	0:08:24	King	Sulak
						Total Dive Tape Time		0:08:24				
4754	Int-Stern	8/4/2004	CEC 4	8:06:54	9:04:36	King	1 of 2	0:57:42	0:00:00	0:57:42	King	Sulak
4754	Int-Stern	8/4/2004	CEC 4	9:41:41	10:04:04	King	2 of 2	0:22:23	0:00:00	0:22:23	King	Sulak
						Total Dive Tape Time		1:20:05				
4755	Mini DV	8/4/2004	CEC 5	15:57:39	16:55:02	Randall	1 of 3	0:57:26	0:00:00	0:57:26	Randall	Shill

Table 4. Cruise USGS-GM-2004-03 Submersible Dive Videotape Synopsis

									Player Counter Time		Scientist	
Dive #	Tape Type	Date	Site Name	Tape Start Time	Tape End Time	Scientific Photographer Responsible	Tape # of #	Total Tape Time	Start	Stop	Fore	Aft
4755	Mini DV	8/4/2004	CEC 5	16:55:35	17:53:22	Randall	2 of 3	0:57:48	0:00:00	0:57:48	Randall	Shill
4755	Mini DV	8/4/2004	CEC 5	17:54:10	18:29:51	Randall	3 of 3	0:35:21	0:00:00	0:35:21	Randall	Shill
						Total Dive Tape Time		2:30:35				
4755	S-digi	8/4/2004	CEC 5	15:57:30	16:55:42	Randall	1 of 3	0:58:12	0:00:00	0:58:12	Randall	Shill
4755	S-digi	8/4/2004	CEC 5	16:56:20	17:54:19	Randall	2 of 3	0:57:59	0:00:00	0:57:59	Randall	Shill
4755	S-digi	8/4/2004	CEC 5	17:55:00	18:32:26	Randall	3 of 3	0:37:26	0:00:00	0:37:26	Randall	Shill
						Total Dive Tape Time		2:33:37				
4755	Int-Stern	8/4/2004	CEC 5	16:59:40	17:17:59	Randall	1 of 1	0:18:19	0:00:00	0:18:19	Randall	Shill
						Total Dive Tape Time		0:18:19				
						Total Time of all Dives:		84:01:20				

Table 5. Cruise USGS-GM-2004-03 Submersible Dive External Digital Still Photograph Synopsis

Station Number	Date	Site Name	Scientific Photographer Responsible	No. of Successful Photographs Taken
JSL-2004-03-4744	7/30/2004	Viosca Knoll 906-907	Sulak	26
JSL-2004-03-4745	7/30/2004	Viosca Knoll 906-907	Ross	0
JSL-2004-03-4746	7/31/2004	Viosca Knoll 906-907	Nizinski	18
JSL-2004-03-4747	7/31/2004	Viosca Knoll 906-907	Brooks	20
JSL-2004-03-4748	8/1/2004	Viosca Knoll 826	King	10
JSL-2004-03-4749	8/1/2004	Viosca Knoll 826	Morrison	7
JSL-2004-03-4750	8/2/2004	Viosca Knoll 826	Caruso	8
JSL-2004-03-4751	8/2/2004	Viosca Knoll 826	Williams	2
JSL-2004-03-4752	8/3/2004	Viosca Knoll 826	Risk	2
JSL-2004-03-4753	8/3/2004	Viosca Knoll 826	Kellogg	33
JSL-2004-03-4754	8/4/2004	CEC 4	King	11
JSL-2004-03-4755	8/4/2004	CEC 5	Randall	34
<i>ALL DIVES COMBINED</i>				171

Table 6. Cruise USGS-GM-2004-03 Fish Specimens Collected

Taxon	No. Specimens	Taxon	No. Specimens
Anthiidae sp. 1	4	<i>Laemonema goodebeanorum</i>	2
<i>Bassogigas? sp.</i>	1	<i>Malacocephalus occidentalis</i>	10
<i>Bathygadus melanobranchus</i>	3	<i>Maurolicus muelleri</i>	1
<i>Bembrops anatirostris</i>	33	Unidentified Midwater Fishes	9
<i>Bembrops gobioides</i>	6	<i>Monomitopus sp.</i>	1
<i>Caelorinchus sp.</i>	1	<i>Facciolella sp.</i>	1
<i>Caelorinchus caribbaeus</i>	92	<i>Paralichthys albigutta</i>	1
<i>Canthidermis maculatus</i>	3	<i>Parasudis truculentus</i>	1
<i>Caranx sp.</i>	1	<i>Physiculus karrerae</i>	4
<i>Carcharhinus falciformis</i>	1	<i>Poecilopsetta beani</i>	31
<i>Conger oceanicus</i>	5	<i>Pontinus longispinis</i>	4
Congridae	2	<i>Pontinus rathbuni</i>	3
<i>Coryphaena hippurus</i>	5	<i>Pseudomyrophis nimius</i>	3
<i>Cyttopsis roseus</i>	1	Scorpaenidae sp.	19
<i>Dibranchius atlanticus</i>	13	<i>Setarches guentheri</i>	1
<i>Epigonus pandionus</i>	1	<i>Gempylus serpens</i>	1
<i>Gnathagnus egregius</i>	1	<i>Steindachneria argentea</i>	11
<i>Grammicolepis brachiusculus</i>	1	<i>Symphurus marginatus</i>	7
<i>Helicolenus dactylopterus</i>	2	<i>Synagrops bellus</i>	1
<i>Hemanthias aureorubens</i>	1	<i>Urophycis sp.</i>	1
<i>Hoplostethus mediterraneus</i>	1	<i>Urophycis cirrata</i>	10
<i>Hoplostethus occidentalis</i>	3	<i>Urophycis earlli?? (Laemonema ?)</i>	24
<i>Hoplostethus sp.</i>	1	<i>Urophycis floridanus</i>	1
<i>Kyphosus incisor</i>	2		
TOTAL SPECIMENS			331

Table 7. Cruise USGS-GM-2004-03 Fish Stomach Content Collections Accomplished for Trophic Analyses

Species	No. of Specimens
Anthiidae sp. #1	4
<i>Bathygadus melanobranchus</i>	2
<i>Bembrops anatirostris</i>	30
<i>Bembrops gobioides</i>	6
<i>Caelorinchus caribbaeus</i>	59
<i>Coryphaena hippurus</i>	5
<i>Dibranchius atlanticus</i>	12
<i>Grammicolepis brachiusculus</i>	1
<i>Hoplostethus mediterraneus</i>	1
<i>Hoplostethus occidentalis</i>	1
<i>Malacocephalus occidentalis</i>	9
<i>Paralichthys albigutta</i>	1
<i>Physiculus karrerae</i>	1
<i>Poecilopsetta beani</i>	1
<i>Pontinus longispinis</i>	4
<i>Pontinus rathbuni</i>	1
Scorpaenidae sp. A	16
<i>Steindachneria argentea</i>	9
<i>Synagrops bellus</i>	1
<i>Urophycis cirrata</i>	10
<i>Urophycis earlii</i>	22
<i>Urophycis floridanus</i>	1
TOTAL	197

Table 8. Cruise USGS-GM-2004-03 Specimen Documentation via Digital Layout Imaging

Fish Taxa	No. Specimens	Credit	Invertebrate Taxa	No. Specimens	Credit
<i>Anthiidae</i> sp. A	1	BH	<i>Acanthacaris caeca</i>	2	JC
<i>Bassogigas?</i>	1	JC	Arrow Crab	1	JC
<i>Bembrops anatirostris</i>	1	JC	Asteroidea (Orange)	1	JC
<i>Caelorinchus caribbaeus</i>	1	BH	<i>Asteroschema</i>	1	JC
<i>Chlorophthalmus agassizi</i>	1	JC	<i>Bathynectes longispina</i>	1	JC
<i>Conger oceanicus</i>	1	BH	Crinoidea	1	JC
<i>Cyttopsis rosea</i>	1	JC	<i>Eumunida picta</i>	1	JC
<i>Grammicolepis brachiusculus</i>	1	JC	Galatheididae	1	JC
<i>Dibranchius atlanticus</i>	1	BH	Galatheididae (White)	2	JC
<i>Gnathagnus egregius</i>	1	JC	Gastropoda	1	JC
<i>Helicolenus dactylopterus</i>	2	JC	Geryonidae sp. A	1	JC
<i>Hemanthias aureoreubens</i>	1	JC	Geryonidae sp. B	1	JC
<i>Hoplostethus occidentalis</i>	2	JC	Grapsidae	1	JC
<i>Kyphosus incisor</i>	1	JC	Holothurian	1	JC
<i>Laemonema barbatulum</i> (<i>Urophycis earlli</i> ??)	1	BH	<i>Lophelia</i> & Crab	1	JC
<i>Laemonema goodebeanorum</i>	2	JC	<i>Lophelia</i> & Octocoral	1	JC
<i>Malacocephalus occidentalis</i>	1	BH	Majidae sp. A	1	JC
<i>Monomitopus</i>	1	JC	Majidae sp. B	1	JC
Nettastomidae	1	JC	Munidae sp. A	1	JC
<i>Parasudis truculentus</i>	1	JC	Munidae sp. B	1	JC
<i>Physiculus karrerae</i>	2	JC	Munidae sp. C	1	JC
<i>Poecilopsetta beani</i>	1	JC	Munidae sp. D	1	JC
<i>Pontinus longispinis</i>	1	JC	<i>Novodinia antillensis</i>	1	JC
<i>Pontinus rathbuni</i>	2	JC	Pencil Urchin	1	JC
Scorpaenidae (<i>Setarches guentheri</i>)	1	BH	Polychelidae	1	JC
Scorpaenidae sp. A	1	BH	Red Crab with Black Claws	1	JC
<i>Steindachneria argentea</i>	2	BH	Reninidae	1	JC
<i>Symphurus marginatus</i>	2	BH	Shrimp (White)	1	JC
<i>Urophycis</i> sp.	1	BH	Sponge (Blue Encrusting)	1	JC
			Urchin	1	JC
				1	JC
			KEY: JC = J. Caruso; BH = W. Harden		
			NOTE: Invertebrate identifications to be determined by		
			Taxonomic Experts		

NEGOM Lophelia Community Ecology Project
Cruise USGS-GM-2004-03

USGS, FISC, Center for Aquatic Resource Studies
Coastal Ecology and Conservation Research Group
K. Sulak, Lead PI

Table 9. Cruise USGS-GM-2004-03 Invertebrate Collections

Species	Major Taxon	No. of Specimens
<i>Acesta?</i>	Mollusc	1
<i>Alpheus</i> sp.	Crustacean	2
Anenome (White)	Cnidarian	10
Antipatharian (Bottle Brush)	Antipatharian	1
Arrow Crab	Crustacean	1
Asteroidea (Pink)	Echinoderm	1
Asteroidae (Orange)	Echinoderm	1
Asteroidea	Echinoderm	2
<i>Astroschema</i>	Echinoderm	1
Bamboo Coral	Octocoral	3
<i>Bathynectes longispina</i>	Crustacean	2
Black coral	Antipatharian	7
Blue Encrusting Sponge	Porifera	1
Brisingid Starfish	Echinoderm	1
Calico Crab	Crustacean	1
Crab sp. A	Crustacean	1
Crinoidea	Echinoderm	6
<i>Echinus</i>	Echinoderm	1
<i>Eumunida picta</i>	Crustacean	7
Flabberellid Isopod	Crustacean	1
Galatheid Crab (White)	Crustacean	2
Gereonidae Crab	Crustacean	45
Glass Sponge	Porifera	1
Gooseneck Barnacle	Crustacean	1
Gorgonian	Octocoral	4
Grapsidae	Crustacean	1
Hermit Crab	Crustacean	3
Holothurian	Echinoderm	1
Holothurian (Purple)	Echinoderm	1
Hydroid	Cnidaria	1
<i>Lophelia pertusa</i>	Scleractinian	36
Majidae sp. A	Crustacean	1
Majidae sp. B	Crustacean	3
Munidae sp. A	Crustacean	10
Munidae sp. B	Crustacean	3
Munidae sp. C	Crustacean	1

NEGOM Lophelia Community Ecology Project
Cruise USGS-GM-2004-03

USGS, FISC, Center for Aquatic Resource Studies
Coastal Ecology and Conservation Research Group
K. Sulak, Lead PI

Table 9. Cruise USGS-GM-2004-03 Invertebrate Collections

Species	Major Taxon	No. of Specimens
Munidae sp. D	Crustacean	1
<i>Acanthacaris caeca</i>	Crustacean	2
<i>Novodinia antillensis</i>	Asteroid	1
Octopus	Mollusca	2
Ophiroid (Orange)	Echinoderm	5
Parchment Polychaete	Annelida	1
Penaeidae	Crustacean	1
Pencil Urchin	Echinoderm	3
Polychaete	Annelida	3
Polychaete (Tube Worm)	Annelida	2
Polychealidae Sp. A	Crustacean	1
Polychealidae Sp. B	Crustacean	1
Portunidae Sp. 1	Crustacean	1
Pycnogonid	Chelicerata	1
Ranillidae	Gastropoda	1
Red Crab w/Black Claws	Crustacean	1
<i>Rochinia crassa</i>	Crustacean	1
Shrimp (<i>Lophelia</i> Associated)	Crustacean	10
Shrimp (Red)	Crustacean	1
Shrimp Sp. A	Crustacean	30
Shrimp Sp. B	Crustacean	22
Shrimp Sp. C	Crustacean	1
Sponge (Tan)	Porifera	1
Sponge (White)	Porifera	1
Squid	Mollusca	1
Top Shell	Gastropoda	2
TOTAL SPECIMENS		262

Table 10. Cruise USGS-GM-2004-03 Sediment Sample Collections

Station Number	Date	Site Name	Status
JSL-2004-03-4744	30-Jul	Viosca Knoll 906-907	Unsorted
JSL-2004-03-4747	31-Jul	Viosca Knoll 906-907	Unsorted
JSL-2004-03-4747	31-Jul	Viosca Knoll 906-907	Unsorted
JSL-2004-03-4747	31-Jul	Viosca Knoll 906-907	Unsorted
JSL-2004-03-4748	1-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4748	1-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4750	2-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4751	2-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4751	2-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4752	3-Aug	Viosca Knoll 826	Unsorted
JSL-2004-03-4752	3-Aug	Viosca Knoll 826	Unsorted
<i>NOTE: All samples obtained via submersible suction sampling device</i>			

Table 11. Cruise USGS-GM-2004-03 Data Pertaining to Genetic Samples Obtained by Morrison, King & Schill

Station Number	Date	Site Name	Species	FTA Card	DMSO	95% EtOH	RNAlater
JSL-2004-03-4744	30-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4744	30-Jul-2004	Viosca Knoll 906-907	Black Coral Sp.			X	X
JSL-2004-03-4745	30-Jul-2004	Viosca Knoll 906-907	Octocoral Sp.	X	X	X	X
JSL-2004-03-4745	30-Jul-2004	Viosca Knoll 906-907	<i>Asteroschema</i>				X
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4747	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4747	31-Jul-2004	Viosca Knoll 906-907	<i>Eumunida picta</i>		X	X	
JSL-2004-03-4747	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4749	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4749	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4749	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4749	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4749	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>		X		
JSL-2004-03-4750	2-Aug-2004	Viosca Knoll 826	<i>Eumunida picta</i>		X		
JSL-2004-03-4750	2-Aug-2004	Viosca Knoll 826	Black Coral Sp.		X		
JSL-2004-03-4750	2-Aug-2004	Viosca Knoll 826	Octocoral Sp.			X	
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X

Table 11. Cruise USGS-GM-2004-03 Data Pertaining to Genetic Samples Obtained by Morrison, King & Schill

Station Number	Date	Site Name	Species	FTA Card	DMSO	95% EtOH	RNAlater
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X		X	
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Eumunida picta</i>		X		
JSL-2004-03-4753	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4753	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4753	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X	X	X
JSL-2004-03-4753	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>		X		X
JSL-2004-03-4753	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>	X	X		X

Table 12. Cruise USGS-GM-2004-03 Synopsis of Stable Isotope Tissue Sampling for Trophodynamic Forensics

Fish Taxa	No. Specimens	Invertebrate Taxa	No. Specimens
Anthiidae	4	Asteroidae	9
<i>Bathygadus melanobranchus</i>	3	<i>Bathynectes longispina</i>	2
<i>Bembrops anatirostris</i>	19	Black Coral sp.	10
<i>Caelorinchus caribbaeus</i>	31	<i>Eumunida picta</i>	4
<i>Canthidermis maculatus</i>	2	Gerionidae	31
<i>Caranx</i> sp.	4	<i>Lophelia</i>	2
<i>Carchrhinus falciformis</i>	1	Munidae	6
<i>Coryphaena hippurus</i>	5	Phytoplankton	3
<i>Dibranchius atlanticus</i>	12	<i>Sargassum</i>	10
<i>Grammicolepis brachiusculus</i>	1	<i>Sargassum</i> Crab	10
<i>Hoplostethus mediterraneus</i>	1	<i>Sargassum</i> Leaves	41
<i>Hoplostethus occidentalis</i>	1	<i>Sargassum</i> Shrimp	23
<i>Kyphosus incisor</i>	1	Shrimp sp. A	27
<i>Malacocephalus occidentalis</i>	5	Shrimp sp. B	20
<i>Paralichthys albigutta</i>	1	Water Hyacinth	21
<i>Physiculus karrerae</i>	1	Zooplankton	3
<i>Pontinus longispinis</i>	4		
<i>Portinus rathbuni</i>	2		
Scorpaenidae	16		
<i>Steindachneria argentea</i>	4		
<i>Synagrops bellus</i>	1		
<i>Urophycis cirrata</i>	10		
<i>Urophycis earlii</i>	23		
<i>Urophycis floridana</i>	1		
TOTALS	153		222

Table 13. Cruise USGS-GM-2004-03 Coral Collections taken for Coral Age, Paleoecology, and Paleoclimate Forensics

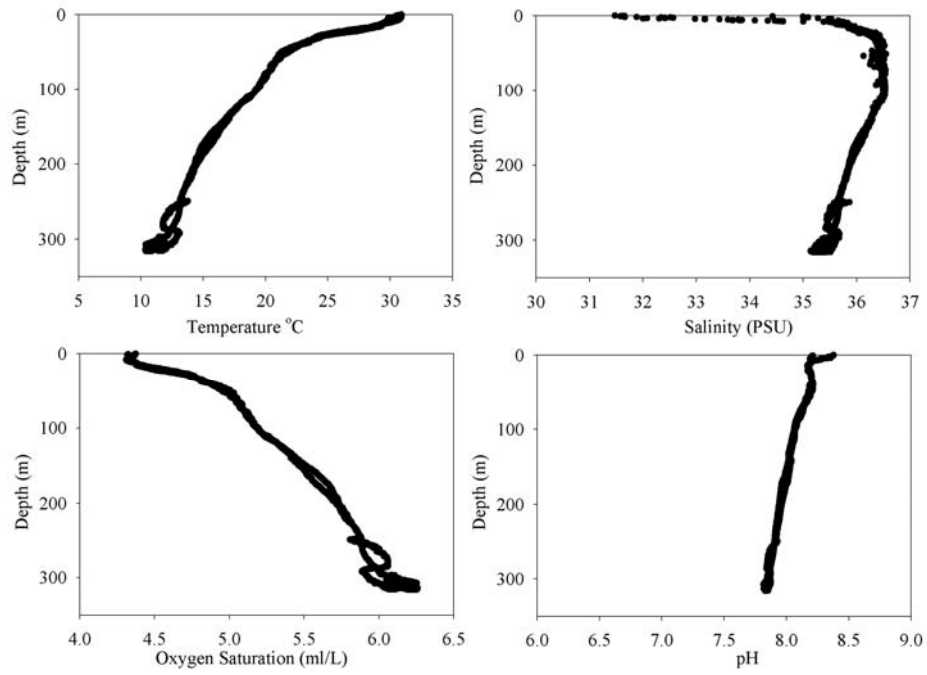
Station Number	Date	Site Name	Species
JSL-2004-03-4744	30-Jul-2004	Viosca Knoll 906-907	Black Coral sp.
JSL-2004-03-4744	30-Jul-2004	Viosca Knoll 906-907	Black Coral sp.
JSL-2004-03-4745	30-Jul-2004	Viosca Knoll 906-907	Octocoral sp.
JSL-2004-03-4745	30-Jul-2004	Viosca Knoll 906-907	Black Coral sp.
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>
JSL-2004-03-4746	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>
JSL-2004-03-4747	31-Jul-2004	Viosca Knoll 906-907	<i>Lophelia pertusa</i>
JSL-2004-03-4748	1-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>
JSL-2004-03-4751	2-Aug-2004	Viosca Knoll 826	Octocoral sp.
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i>
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i> (Rubble)
JSL-2004-03-4752	3-Aug-2004	Viosca Knoll 826	<i>Lophelia pertusa</i> (Rubble)

APPENDIX II

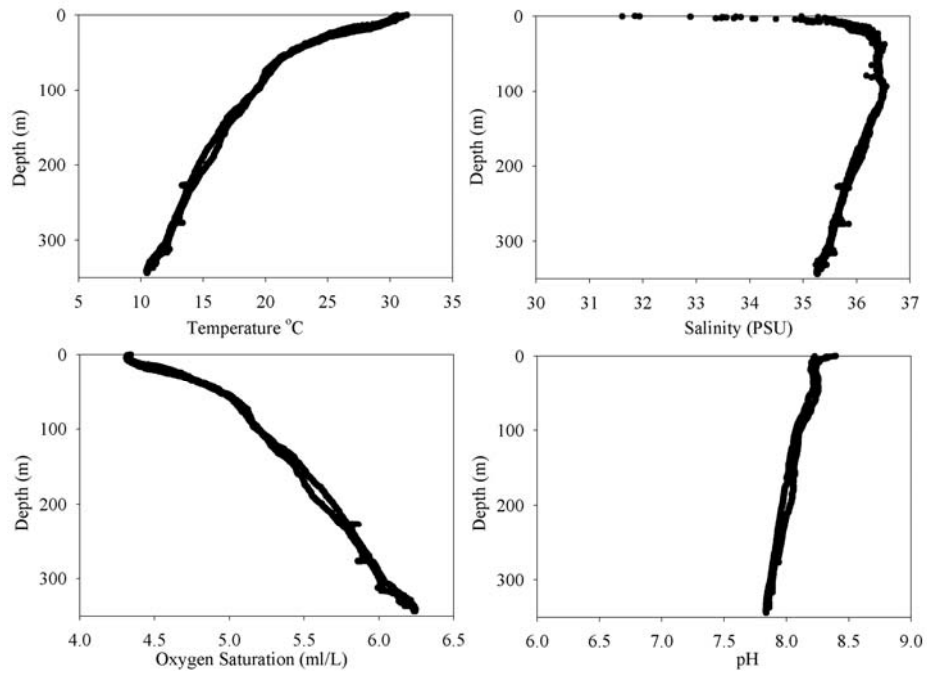
CTD Data

(Graphical Renditions)

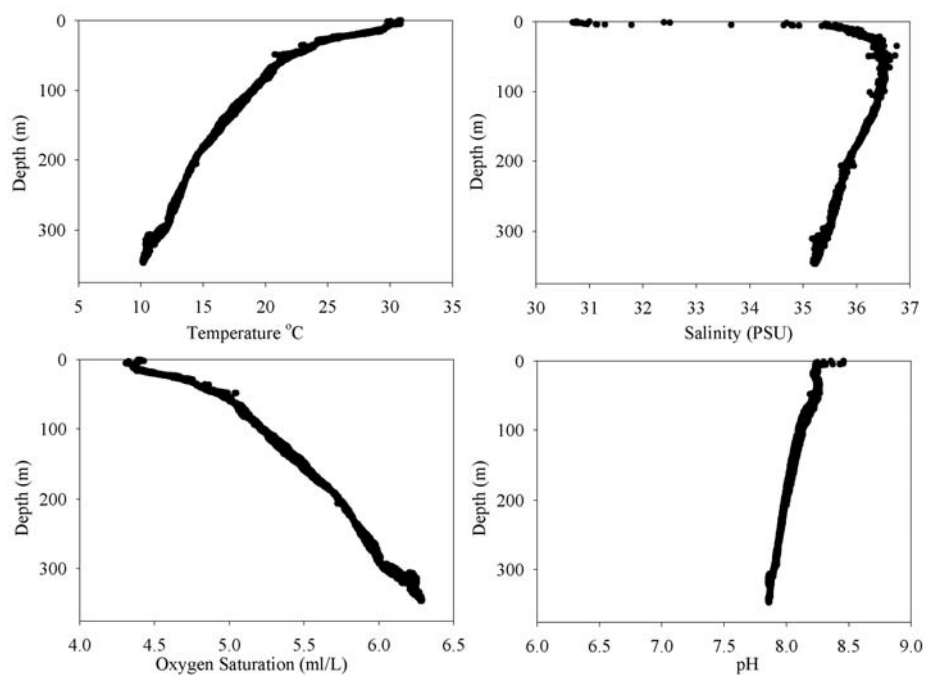
USGS-GM-2004-03-JSLI-4744 CTD Data



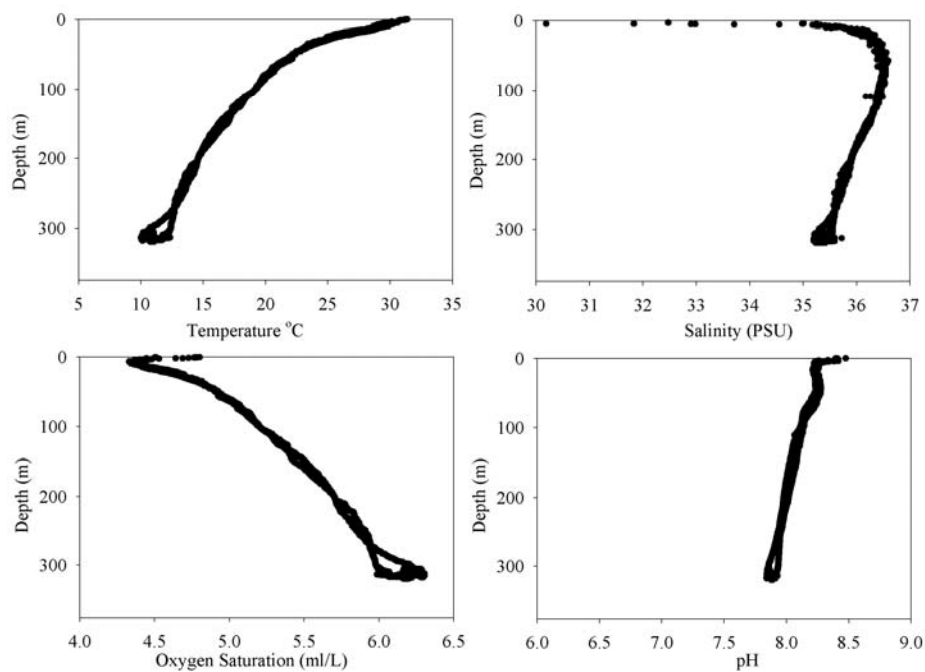
USGS-GM-2004-03-JSLI-4745 CTD Data



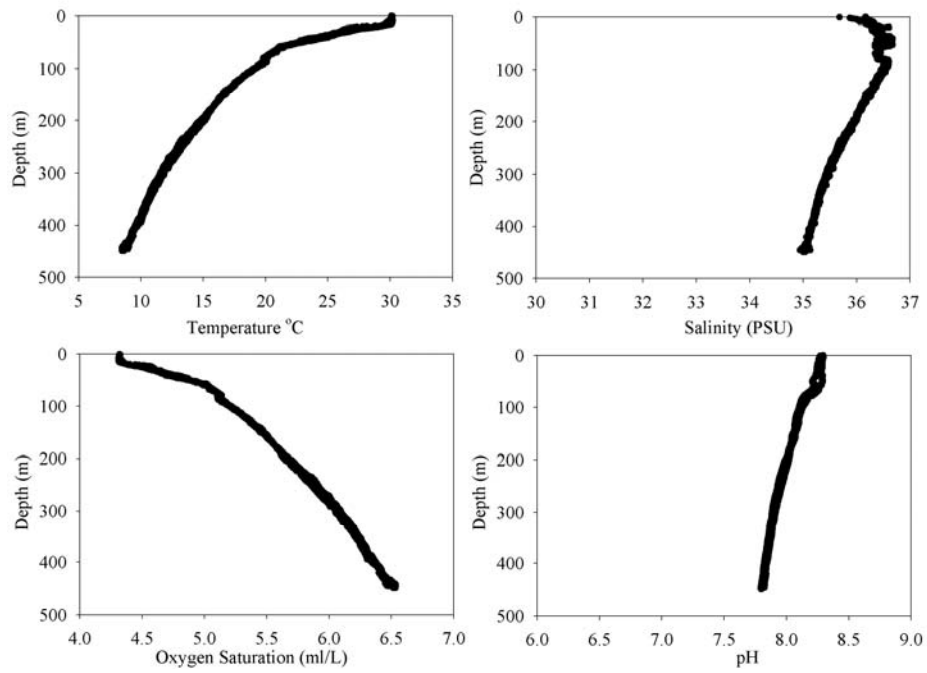
USGS-GM-2004-03-JSLI-4746 CTD Data



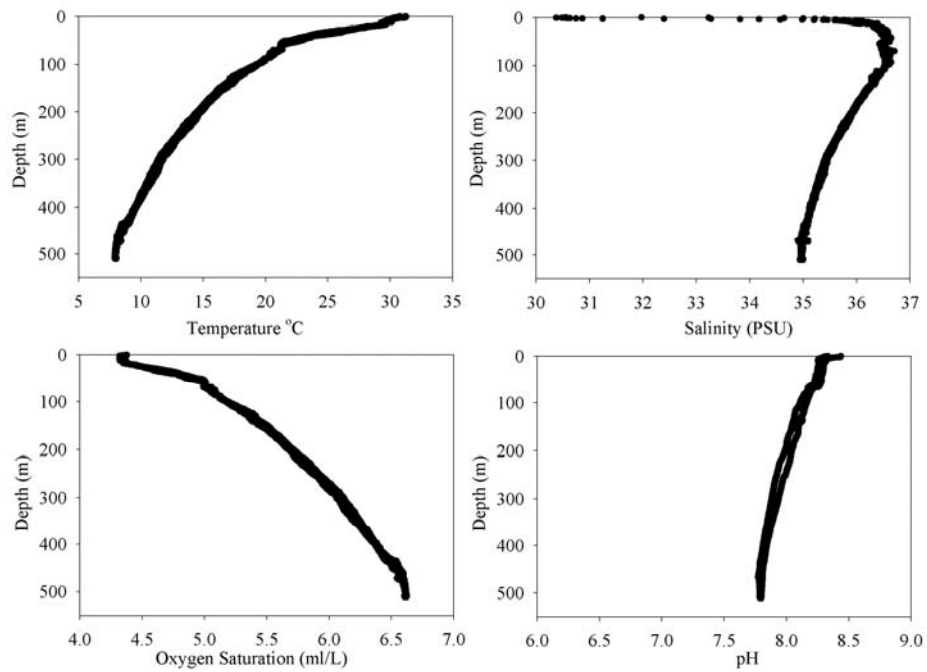
USGS-GM-2004-03-JSLI-4747 CTD Data



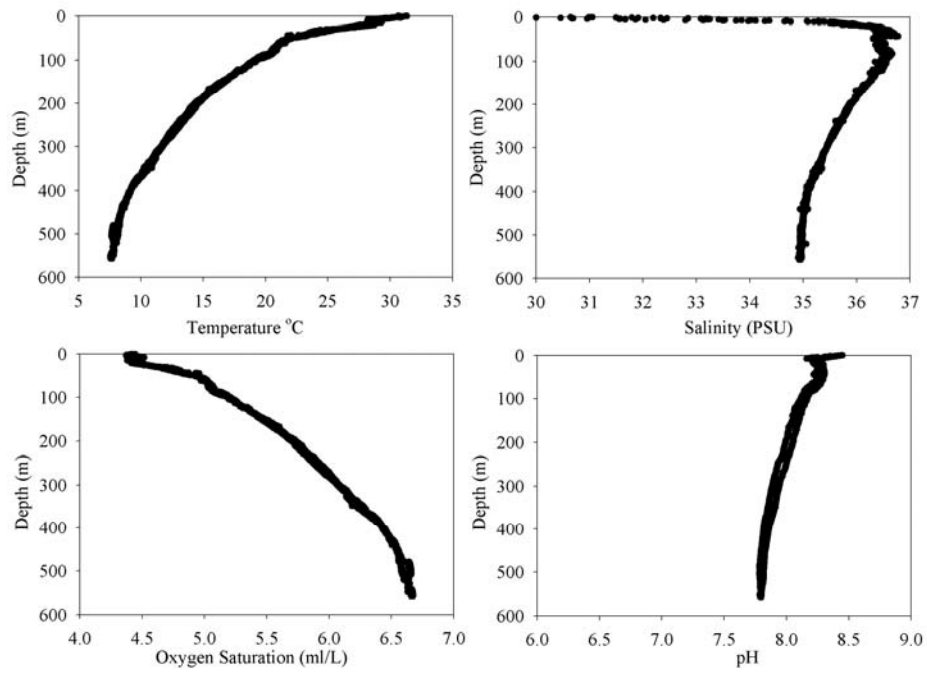
USGS-GM-2004-03-JSLI-4748 CTD Data



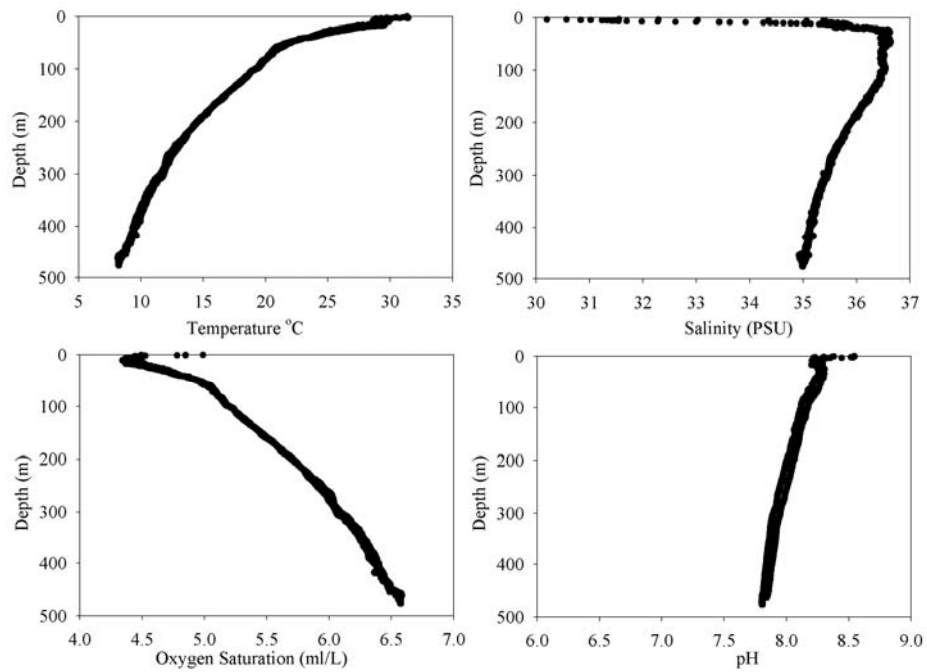
USGS-GM-2004-03-JSLI-4749 CTD Data



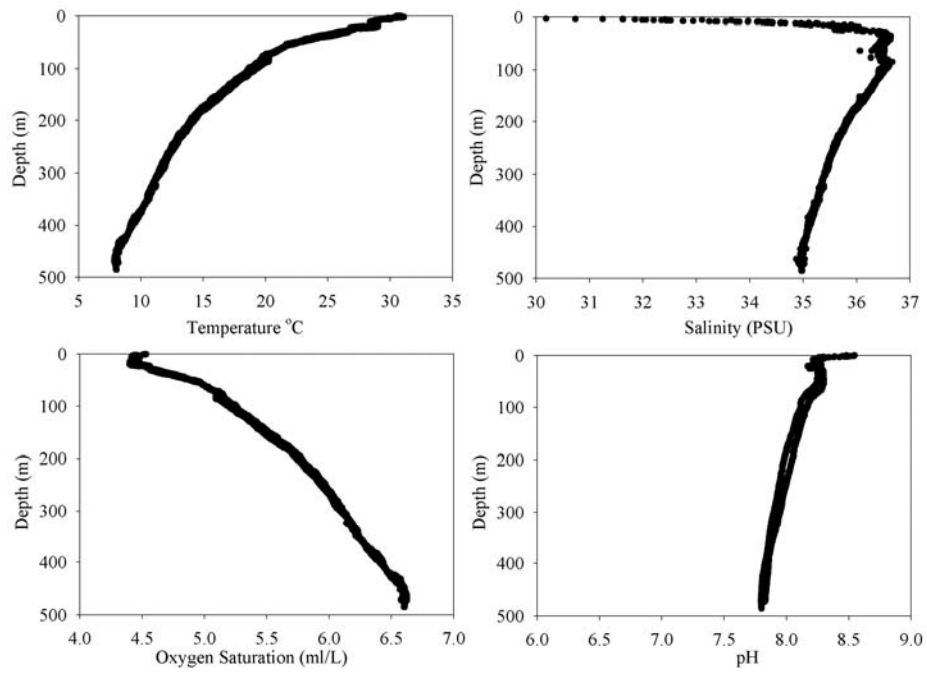
USGS-GM-2004-03-JSLI-4750 CTD Data



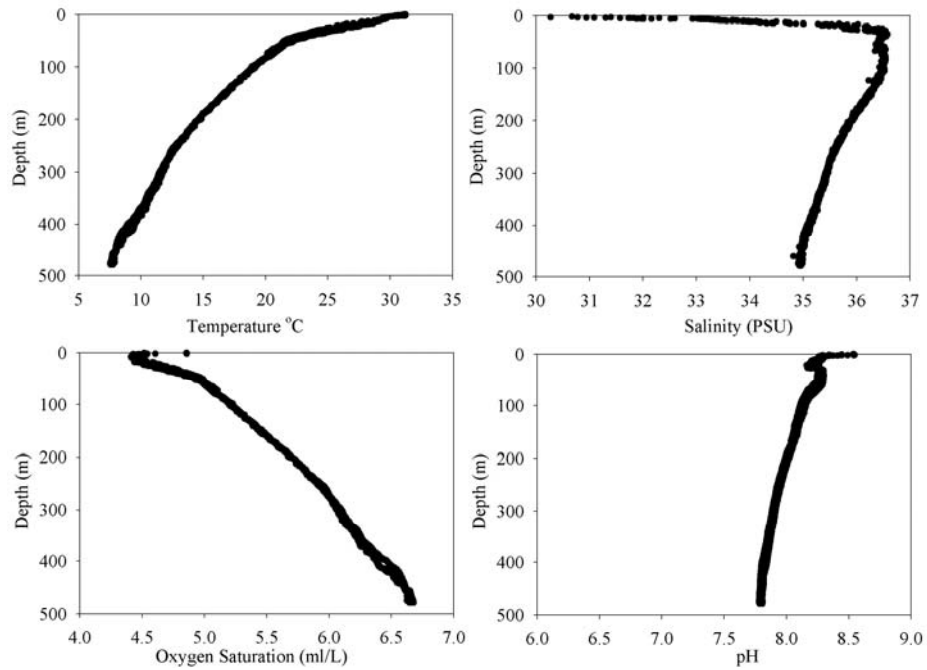
USGS-GM-2004-03-JSLI-4751 CTD Data



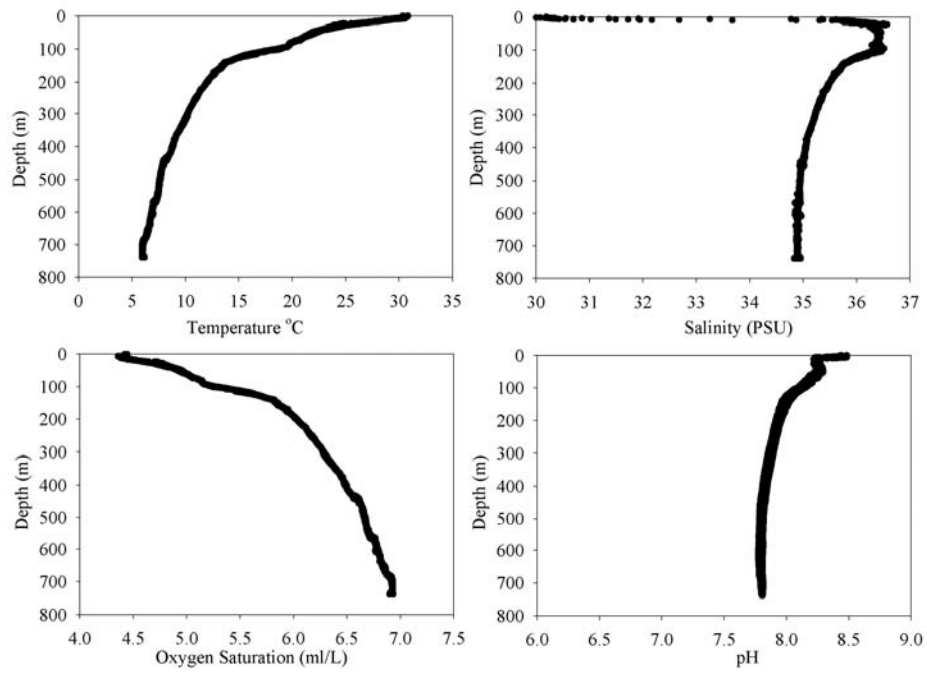
USGS-GM-2004-03-JSLI-4752 CTD Data



USGS-GM-2004-03-JSLI-4753 CTD Data



USGS-GM-2004-03-JSLI-4754 CTD Data



USGS-GM-2004-03-JSLI-4755 CTD Data

